Israel Exploration Journal

VOLUME 4

JERUSALEM, ISRAEL * 1954

ISRAEL EXPLORATION JOURNAL

PUBLISHED BY THE ISRAEL EXPLORATION SOCIETY

WITH THE ASSISTANCE OF THE JEWISH AGENCY, THE DEPARTMENT OF ORGANIZATION OF THE HEBREW UNIVERSITY AND THE AMERICAN FUND FOR ISRAEL INSTITUTIONS

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THIS JOURNAL *is non-political and seeks only to further the pursuit of knowledge. Its main purpose is to communicate to scholars abroad the results of scientific investigations of the Near East as carried out in Israel. But as fruitful work can be accomplished only by reciprocal endeavour, papers from contributors in other countries will be gladly considered. The subjects to be dealt with include the history, archaeology and culture of the countries of the Near East, as well as their geography and natural features.—The Editors are not responsible for the opinions expressed by contributors.*

Israel Exploration Journal

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Dwarf Craftsmen in the Keret Epic and Elsewhere in North-West Semitic Mythology*

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WHEN the hero of the Keret epic levies a vast army from the 'Southland' *(NGB)* in order to gain possession of King Pabel's daughter, the latter offers him silver, gold, and slaves in order to save the land of 'Udum from the invaders.[1] Among the gifts is mentioned several times *tlt · sswm · mrkbt · b-trbṣ(t) · bn · 'amt*. Two translations have in general been preferred by different scholars: 'three horses, a chariot from the stable(s) of the son of the maid-servant,'[2] 'a groom, horses, chariots, from the stables of a son of a handmaid.'[3] Against the first has often been adduced the fact that the feminine of the cardinal number would be used in Hebrew. Ginsberg first rendered 'groom', comparing Hebrew שלישׁ, which may have this meaning (as the 'third' in a Hittite chariot), but now prefers 'one-third (of the chariot-steeds in the stable of a handmaid's son).'[4] How-

* This paper is published in Hebrew in *Eretz-Israel*, 3, 1953 (Cassuto Memorial Volume), pp. 58-59.

[1] Keret A, lines 128 f., 140 f., 252 f., 271 f., 285 f.

[2] This was already Virolleaud's rendering in the first publication *(La légende de Keret, roi des Sidoniens.* Paris, 1936, p. 43 ff.), except for his taking the last two words as a proper name: Ben-Amat. I followed him the same year (*BASOR*, 63, 1936, p. 31), suggesting for the last two words 'the Son of Maid (Astarte)'. C.H. Gordon renders similarly: 'A team of three horses, a chariot from the yard of a handmaid's son' *(Ugaritic Literature.* Rome, 1949, p. 73).

[3] H.L. Ginsberg: *The Legend of King Keret. BASOR,* Suppl. Stud., 2-3, 1946, p. 17 ff.

[4] In J.B. Pritchard, ed.: *Ancient Near Eastern Texts Relating to the Old Testament.* Princeton, 1950, p. 144.

ever Gordon has advanced a decisive argument in favour of the first alternative by comparing the passage in the Odyssey (4: 590) where 'three horses and a well-polished chariot' are included among the gifts.[5] Moreover, he has shown that Ugaritic employed cardinals (specifically *tlt*)of masculine form with nouns of both genders.[6] We must, therefore, translate: 'three horses (and) a chariot from the stable(s) of the *BN 'AMT*.' But what is meant by the latter?

For the past decade I have been rendering the latter expression as 'dwarfs', literally 'sons of a cubit' *(banû 'ammati)*, though I have nowhere mentioned this interpretation in print. As soon as the material already available in Greek and Rabbinic sources, as well as in European mythology, is examined, the necessitv of this translation should become obvious. The Greek word for 'dwarfs' from Homer onward, is *Pygmaioi* (Πυγμαῖοι),[7] from *pygmê*, 'fist, knuckles' and 'distance from closed fist to elbow=18 fingers' (the Greek foot was sixteen fingers or four spans). This is a little less than a cubit, but undoubtedly represents an older Greek unit than the *pêchys*, 'cubit', and may be etymologically connected with Greek *pygôn*—measure of 20 fingers.

In Rabbinic literature we have two references to superhuman or legendary dwarfs measuring a cubit each in height. According to Mo'ed qaṭon Bab., 18a[8] Pharaoh (Moses' contemporary) was a cubit tall, his beard was a cubit long, and his penis was a cubit and a span long (הוא אמה וזקנו אמה ופרמשתקו אמה וזרת)— possibly a long-range reminiscence of the Egyptian Bes figurines, which were widely distributed in Asia as well as in Egypt.[9] Giṭṭin Bab., 14 b=Jer. I end, 43 d,[10] tells of superhuman judges (in the underworld?) who were a cubit tall and had tiaras a cubit high (Jer.: אותן בני אדם והן אמה וכובעיהן אמה). Though the expression בני אמה is not used, it would have been just as natural as Biblical בני ענק for 'giants'.

While there is nothing in Rabbinic or Greek literature, as far as I know, to suggest that the later Mediterranean peoples told stories of the dwarfs as metallurgists and craftsmen of superhuman skill, this tradition survived, as is well known, among the Germanic peoples, where the treasures of the dwarfs once

[5] *Introduction to Old Testament Times*. Ventnor, N. J., 1953, p. 97, and already in *Amer. Journ. of Archaeol.*, 56, 1952, p. 94. [6] *Ugaritic Handbook*, I. Rome, 1947, p. 34, § 7. 7.

[7] See especially the article 'Pygmäen' in W. H. Roscher: *Lexikon der griechischen und römischen Mythologie*, III 2. Leipzig & Berlin, 1884-1934. Cols. 3283-3317. [8] Cf. J. Levy: *Neuhebräisches und chaldäisches Wörterbuch*, IV. Leipzig, 1876-89, p. 118b; L. Ginzberg: *Legends of the Jews*, II. Philadelphia, 1910, p. 298 f.

[9] The corresponding proportions of certain dwarfish *djinn* in the Arabian Nights presumably go back to the same circle of concepts. [10] Cf. Levy, *op. cit.* (supra, n. 8), I, p. 95b.

played an important role in myth and folklore, and their skill as craftsmen was in wide repute. That there were similar ideas current among the Phoenicians has long been inferred from the somewhat obscure statements of Herodotus, II, 37, who says that Cambyses (circa 525 B.C.) forced his way into the temple of the 'Cabiri' *(Kabeiroi)* in Memphis, and adds that the latter were regarded as sons of Hephaestus (Ptaḥ) and that they resembled the Phoenician *Pataikoi* and the Greek pygmies. In all probability both the Kabeiroi and the Pataikoi bear Greek names; current Phoenician etymologies are too unlikely to warrant mention here. Nor do we know enough about the Egyptian 'creator-gods' *(Ḫnmw)* to know whether they correspond to the 'Cabiri' of Herodotus or not, though this has been asserted. All we can safely infer from the text of Herodotus is that there was some sort of cult of artificer deities at Memphis, who had Phoenician as well as Egyptian associations. In the light of Philo Byblius (Eusebius, *Praep. evan.*, I, x, 11 f.),[11] it is certain that there were precisely such close parallels between Egyptian and Phoenician cultic practices and beliefs in the area of artificer gods. That Ptaḥ corresponds to Canaanite Koshar (Ugar. *Kôṯar*, Aram. *Kautar*, Phoen. *Kûšôr*) has been known for some time.[12] The important fact for us is that the artificer gods of Memphis were believed by Herodotus to have been dwarfs.

From the foregoing observations it follows that the Canaanites knew of a mythological race of dwarfs, who were artificers and who possessed superior horses and chariots in their stables. It is highly probable that we have a forgotten reminiscence of them in the Biblical *Meteg ha-'Ammah*, which David took from the Philistines, according to 2 Sam. viii, 1.[13] Since it is certain from several clear passages that מתג meant 'horse's bit', i. e. the bronze or iron mouthpiece of a bridle, we are justified in considering מתג האמה as an abbreviation of an older מתג «בני» אמה, 'Horse's Bit of the Dwarfs', like similar abbrevia-

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[11] Cf. C. Clemen: Die phönikische Religion nach Philo von Byblos, *Mitt. Vorderasiat.-Aegypt. Gesellsch.*, 42, 1939, p. 23 f.

[12] So already Philo, *loc. cit.*, and cf. now especially my discussion: *Archaeology and the Religion of Israel.* 2nd ed., Baltimore, 1946, p. 81 f., with the references on p. 196 f. Of older studies the following may still be heartily recommended: G. Hoffmann, *Zeitschr. f. Assyriol.*, 11, 1896, p. 253 ff.; H. L. Ginsberg, *Orientalia*, 9, 1940, p. 39 ff.; W. F. Albright, *Journ. Amer. Orient. Soc.*, 60, 1940, p. 296 f.

[13] The parallel passage, 1 Chron. xviii, 1, replaces this enigmatic name by גת ובנותיה, all other words being the same as in Samuel. The Chronicler habitually omits or paraphrases obscure expressions in his older sources. The alteration would have been easier if—as is quite possible—his *Vorlage* still read מתג בני האמה.

tions of place-names elsewhere in Palestine.[14] Similarly, it is possible that גבעת אמה stands for גבעת «בני» אמה, 'Hill of the Dwarfs'. It is scarcely necessary to say that we have no means of knowing how the designations arose — presumably from local tales based on some similarity of form or on some accidental find of ancient metal objects attributed to the workshops of the dwarfs.

[14] In *AASOR*, 4, 1924, p. 160, I have collected nearly a score of examples of ancient Palestinian place-names where we find forms with and without the element *bêt*, 'house'. Directly parallel to our presumed doublets, with and without *benê*, 'sons of', is רבת בני עמון, which appears in Polybius (second century B.C.) as *Rabbatamana;* in the Bible this name is generally written simply רבה, and today it is simply *'Ammân*. Similarly we find the abbreviated form *Abilakka* (for **Abilmakka* for אבל בית מעכה in the inscriptions of Tiglath-Pileser III (eighth century B.C.).

Studies in the St. Mark's Scroll-V*

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NUMEROUS articles have appeared in the past few years dealing with the textual criticism of the St. Mark's Isaiah Scroll (hereafter designated SM) and its relative value as compared with the Massoretic Text (hereafter MT). In his review-article 'Der palästinische Handschriftenfund, Zweiter Bericht' in the *Theologische Rundschau*, 19, 1951, pp. 97-154, W. Baumgartner conceded the superiority of MT as against SM in the case of several variants discussed by the author in *Journal of Biblical Literature*, 69, 1950, pp. 149-166, but suggested that preference be given to ten other variants in SM. The author dealt with the first three of these elsewhere,[1] and proposes to discuss here the fourth variant, Isaiah xv, 9.

Chapters xv and xvi in Isaiah are devoted to the 'Burden of Moab', and all of Moab's territory and its important towns are pictured by the prophet as about to be laid waste. Ar and Kir are mentioned in xv, 1, and Dibon, Nebo and Medeba find their place in verse 2. Heshbon, Elealeh and Jahaz are referred to in verse 4, and Luḥith (מַעֲלֵה הַלּוּחִית) and Horonaim (דֶּרֶךְ חוֹרֹנַיִם) in v. 5. In v. 6 there is mention of 'the Waters of Nimrim,' and in v. 8 of Eglaim and Beer-elim. In v. 9 the prophet continues with, כִּי מֵי־דִימוֹן מָלְאוּ דָם כִּי אָשִׁית עַל־דִּימוֹן ... נוֹסָפוֹת 'For the waters of Dimon shall be full of blood: for I will bring more upon Dimon...'

The identification of Dimon is unknown,[2] though most recent students of the topography are of the belief that Dimon is to be equated with Madmen mentioned in Jer. xlviii, 2. Many scholars, however, noting the fact that Dimon differs from the well-known place Dibon only by having a *mem* in place of a

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* For studies I-IV see *Jewish Quarterly Review*, 43, 1952-53, pp. 329-340 and n. *. Study VI has been accepted for publication in the *Hebrew Union College Annual*, 25, 1954: it deals with the fifth and sixth variants mentioned by Baumgartner. [1] In *Jewish Quarterly Review*, 43, 1952-53, p. 329 ff.
[2] F. M. Abel: *Géographie de la Palestine*, II. Paris, 1938, pp. 305 and 372 ('...מי דימון que les commentateurs confondent avec Dibon'); B. Maisler: *The Graphic Historical Atlas of Palestine*. Tel Aviv & Jerusalem, 1941, p. 39b; G. E. Wright & F. V. Filson: *The Westminster Historical Atlas to the Bible*. Philadelphia, 1945. Index to the maps, s.v. Dimon and Madmen (with a query), and H. G. May: *A*

beth, and since the Vulgate reads *Dibon*, either emended MT דימון to דיבון, or else simply identified the former with the latter.[3] When SM came along with the reading דיבון *(bis)*, the matter seemed clinched; cf. Baumgartner, '*djbwn* ... wie sonst.' Yet the fact is that quite the contrary is true!

(a) It will be noted that no place is mentioned more than once in chapter xv. Dibon is mentioned in v. 2, after Nebo and Medeba, and there is no reason for its being mentioned again in v. 9. (b) The argument of paronomasia in favour of the equation Dimon-Dibon is singularly weak. The punning element merely justifies the use of מָלְאוּ דָם in connection with דימון, in the manner that (בּוֹ) יִבְכֶּה (בְּבֶכִי) is used in association with (הַלּוּחִית) מַעֲלֵה in v. 5; תִּדְמִי with דִּמְּנִי in Jer. xlviii, 2; (עָלֶיהָ רָפָה) חֶשְׁבּוֹ with חֶשְׁבּוֹן (ibid.); and similarly in every book of the Bible. In no case, however, is there any shred of evidence that alleged דיבון was altered to דימון on account of the use of דָּם![4] (c) What seems to have been overlooked is that MT דימון is original no matter what line of argument is employed: (i) If דיבון were really intended by the author, and he used instead the form דימון because of the assonance with דָּם (a most unlikely notion *per se*), then דימון is original, and דיבון (as in SM; or as a proposed emendation) is clearly secondary; (ii) If דיבון were original, then one would have to assume that the author did not intend any paronomasia at all, and that original דיבון became MT דימון by corruption; but in that case—quite an implausible assumption *per se*—one would have to assume that the corruption then extended also to the second דיבון, so that it too became דימון, a most unlikely development.[5]

Remapping of the Bible World. Nelson's New Bible Maps. New York, 1949, p. 24, all would equate our Dimon with Madmen in Jer. xlviii, 2 and find its identification in Khirbet Dimne. It should be noted that several of the places cited in this chapter by Isaiah have not been identified (cf., e. g., on Luḥith S. R. Driver: *Notes on the Hebrew Text and the Topography of the Books of Samuel*. 2nd ed. Oxford, 1913, p. XCV); but it is Dimon's misfortune to resemble Dibon!

[3] I. M. Casanowicz: *Paronomasia in the Old Testament*. Boston, 1894, p. 43 (cf. No. 83 on p. 52), would explain דימון as a deviation 'from the regular grammatical usage (viz. דיבון) for the sake of conformity of sound', viz. דָּם. Among the numerous commentators who share this opinion may be mentioned Franz Delitsch: *Jesaia*. Leipzig, 1869; C. J. Bredenkamp: *Der Prophet Jesaia*. Erlangen 1887; A. Dillmann & R. Kittel: *Der Prophet Jesaja*. 6th ed. Leipzig, 1898; R. R. Ottley: *Isaiah according to the Septuagint*, II. Cambridge, 1906, pp. 185-6; G. B. Gray: *International Critical Commentary on the Book of Isaiah*. New York, 1912, p. 285; E. J. Kissane: *The Book of Isaiah*, I. Dublin, 1941, p. 191. There are some who would identify both Dimon and Madmen with Dibon; cf., e. g., F. Buhl: *Geographie des alten Palästina*. Freiburg i. Br. & Leipzig, 1896, p. 268, § 135; L. Koehler: *Lexicon in Veteris Testamenti Libros*. Leiden, 1949, s. vv., an easy way to solve the problem.

[4] Indeed, not one of the eight alleged parallels cited by Casanowicz (*op. cit.*, supra, n. 3) for Dibon becoming Dimon is pertinent.

[5] Thus, e. g., the first דימון in MT became 'ב primo' in B. Kennicott: *Vetus Testamentum*. Oxford,

(d) The evidence of the versions, when properly studied, is definitely in favour of MT דימון: (i) All the earlier witnesses to the LXX (the Chester Beatty Papyri, the Codices Sinaiticus, Vaticanus and Alexandrinus, etc.), with such readings as ρεμμων, δεμμων, δειμων, δημων, and νεμμων, the Targum (דימון), Theodotion,[6] Aquila, Symmachus and *Hebraios* (διμων), support the *mem* in MT Dimon; the Bohairic (ερεμων) testifies further to this early reading in the LXX,[7] as does the Syro-Hexapla (דימון); (ii) Some time after the turn of the Era, διβων came into being alongside or in place of original διμων; thus the Syriac reads ריבון (sic!),[8] and such fourth-fifth century sources as Eusebius,[9] the Vulgate[10] and Codex Venetus read δ(ε)ηβων/*Dibon,* and this secondary tradition was taken over by a number of tenth-eleventh century manuscripts of the LXX (e. g. 87, 91, 309, 490, in Ziegler's apparatus), and in the commentary of Basil the Great[11] (as against ρεμμων in Cyril's Commentary).[12] To single out Vulgate *Dibon* as the authority for דיבן (not to mention the omission of Syriac

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1776-80, mss. 297, 337; but the second דימון did not. Scholars would not so readily have emended MT דימון into דיבון if they had realized with O. Procksch: *Jesaia,* I. Leipzig, 1930, p. 214, that '...Eine Gleichung von דימון mit דיבון ... scheint mir schon aus topographischen Gründen ausgeschlossen zu sein... denn wir stehen jetzt durchweg im südlichen Moab. Dagegen enthält das Königsbuch (2 Kings iii, 21 ff.) wahrscheinlich eine Anspielung auf Dimon...'. In addition, the place-name דִּימוֹנָה in Josh. xv, 22 (of which דיבון in Nehemiah xi, 25 is generally regarded as but a corruption; see e. g., Abel, *op. cit.,* supra, n. 2, II, p. 305), should have served as a *caveat* for would-be emendatores.

[6] Scholars still persist in dating Aquila before Theodotion, when all the available data point to the contrary; cf. Orlinsky: *On the Present State of Proto-Septuagint Studies* (American Oriental Society, Offprint Series, No. 13). New Haven, 1941, p. 85, n. 17. The relative position of Aquila and Theodotion in Origen's Hexapla does not involve any relative chronology; see my discussion in *Jewish Quart. Review,* 27, 1936-37, pp. 137-49, and the reference to its acceptance by Giovanni Cardinal Mercati in *The Study of the Bible Today and Tomorrow.* Chicago, 1947, p. 156, n. 16, and J. Ziegler: *Septuaginta* XIV, *Isaias.* Göttingen, 1939, p. 113 and n. 5.

[7] In his recent study of 'The Sahidic Coptic Text of 1 Samuel' (*Journ. Bibl. Liter.,* 72, 1953, pp. 51-62), J. B. Payne has concluded that 'the Sahidic Texts of 1 Samuel indicate ... that the original LXX was closer to MT than has sometimes been supposed.' For the Coptic of Isaiah, see Ziegler, *op. cit.* (supra, n. 6), pp. 14 ff., 30 35.

[8] Perhaps a corruption of דיבון, or, though less likely, דימון; note the reading Ρεμμών in the LXX (which became *Rhebon* in the Latin transcription; see infra, n. 12).

[9] *Onomastica Sacra,* ed. P. de Lagarde, p. 288, 147, 12, Ρεμμών. Ἡσαΐας ἐν ὁράσει τῇ κατὰ τῆς Μωαβίτιδος. Or cf. the Hebrew edition of the *Onomasticon* by E. Z. Melamed. Jerusalem, 1950, pp. 18 (175a) and 39 (389a).

[10] Hieronymus: *Commentarius in Isaiam Prophetam.* ad. loc., equated דימון with דיבון, '...usque hodie indifferenter et Dimon et Dibon hoc oppidulum dicitur...'

[11] *San Basilio Commentato al Profeta Isaia,* ed. P. Trevisan. Torino, 1939, IV, p. 515.

[12] *Cyrilli Commentariorum in Hesaiam,* II. ed. J. Aubert. 1638, p. 252, ὅτι τὸ ὕδωρ τὸ Ρεμμών, for which the Latin read *Aqua Rhembon;* in the Paris edition of 1605, p. 193 b, the Latin reads *Aqua Rhebon* (implebitur sanguine).

דיבון), as Kittel has done, only makes a farce of the textual criticism of the Hebrew Bible.[13]

It is clear that MT דימון is original, regardless of its identification. SM דיבן is then, as usual, only a secondary development, and has no more authority than Vulgate *Dibon*. There is no reason, however, to associate SM with the Vulgate, any more than with the Syriac or with the later LXX manuscripts.[14]

[In the discussion following the presentation of this paper at the American Oriental Society, W. F. Albright remarked that 'דיבון is a faulty reading' (cf. the report by Father R. O'Callaghan in *Orientalia*, 20, 1953, p. 427).

In the light of the data presented here, it is unlikely that B. J. Roberts would still adhere to the statement '...we have דיבן for M. T. דימון which corresponds with the form in the Vulgate and is probably correct'. (The Dead Sea Scrolls and the Old Testament Scriptures, *Bull. John Rylands Library*, 36, 1953, p. 94).]

H. M. O.

[13] Actually, Kittel's note ('ad loc דיבן (V)') is senseless. If Kittel wanted to emend MT דימון to דיבן on the basis of the Vulgate, than he should have noted: 'l. c. V דיבן.' If his purpose, however, was to explain דימון as only another form of דיבן (following Duhm and Marti), with the Vulgate as the authority, then why should he have noted this alleged equation altogether, since his critical apparatus was not meant to be, and regularly is not, a commentary on the Hebrew text?

[14] Cf. Burrows, *BASOR*, 111, 1948, p. 22, 'the readings of Vulg. and this Ms. may of course be merely obvious and independent corrections.'

The Roman Road to Aila (Elath)*

Y. AHARONI

Department of Antiquities

THE Roman road to Aila (Elath) was one of the principal roads in the Negev. The caravans which passed along this road to the harbours of the Red Sea and to the Arabian Peninsula were one of the main economic factors in the development of the Negev cities in the Roman-Byzantine period. The importance of the road to Aila (Elath) was still further enhanced at the end of the third century, when the Tenth Legion (Legio X Fretensis) was transferred from Jerusalem to Aila and the latter thus became the principal base for the organization of the *Limes Arabicus*, the Roman fortified border against the desert nomads.

It is no wonder, therefore, that the fourth century road-map known as the Tabula Peutingeriana,[1] which shows only the principal lines of communication, should have in the Negev only the one road to Elath (Fig. 1). On this road are marked the following stations: *Hierusalem — Elusa — Oboda — Lysa — Gypsaria — Rasa — Ad Dianam — Haila.*

The first and last stations are obvious: Elusa—חלוצה (el-Khalasa, now, Ḥalutsa) about 20 km. south-west of Beersheba; Oboda or Eboda ('Abda, now 'Ovdath) ca. 37 km. south-east of Elusa; Ad Dianam ('Ain Ghadhyan, now Jotbathah) in the 'Arava about 40 km. north of Elath; Haila=Aila=Elath, viz. the area of Roman-Byzantine ruins, one km. north-west of 'Aqaba.

We see, therefore, that the road continued from Elusa to Eboda and then across the mountains of the Negev towards the 'Arava (el-Ghadhyan), whence it proceeded southwards to Aila. The problem is, how are we to identify the three middle stations of the Tabula Peutingeriana and where did the road pass between Eboda and Ad Dianam?

The second-century geographer Ptolemy notes in this area the following sequence: Εβωδα—Λυσα—Γουββα—Γυψαρια—Γερασα, i.e. he adds a station

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* This paper has been published in Hebrew in *Eretz-Israel*, 2,1953, pp. 113-116.

[1] Tabula Peutingeriana, ed. K. Miller, *Itineraria Romana*. Stuttgart, 1916.

called *Gubba* between Lysa and Gypsaria. It seems that the name Gerasa (as he called the station after Gypsaria) is the correct form, which became shortened to Rasa in the Tabula Peutingeriana.

The fact that these four stations, between Eboda and Ad Dianam, are not mentioned in any of the later Byzantine sources (Notitia Dignitatum, the Beer-sheba edict[2]) has been explained by Alt[3] as being due to a change of names in the fourth to sixth centuries. He bases his assumption on the theory that the road referred to is the one observed by Frank[4] which crosses the Makhtesh Ramon and continues through the Niqra Valley (Wadi es-Siq). We can prove, however, that there was another road, the existence of which can be ascertained from archaeological and topographical evidence; and that this road corresponds to our sources. Indeed it can be shown that Alt's assumptions are unfounded on three points:

(a) *Change of names.* There is no reason to assume any change of names as all these names are Semitic-Nabataean (with the sole exception of the Latin Ad Dianam). Most of the ancient names in the Negev have been preserved in their Arabic form till this day, for example Ad Dianam-Ghadhyan, Aridella-Gharandal, Eiseba-Ḥusb, etc. But even if the Romans had changed the names in the Negev, it is hard to understand why stations on the same road should be called in the sixth century by names different from their names in the fourth, and to believe that not even one of the earlier names survived into our later sources. So long as there is no definite proof of such a change it seems wiser to assume that different names referred to different places.

(b) The name *Lysa* has been preserved in the Jebel and Wadi Lussan (today Mount Lots).[5] Even Alt has to admit that Lysa and Lussan correspond both linguistically and archaeologically. In the area of Lots Valley have been found not only the remains of considerable settlements, but also clear traces of a road coming from the direction of Eboda and continuing its descent from Mount Ramon (Ras er-Raman) by way of the southern Beer ʿOdeid (Byar el-ʿIdeid) to the ʿArava.

(c) The *distances* set out in the Tabula Peutingeriana do not fit in with the

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[2] *Notitia dignitatum*, ed. O. Seeck. Berlin, 1876; A. Alt: *Die griechischen Inschriften der Palaestina Tertia*. Berlin & Leipzig, 1921; F. M. Abel, *RB*, 1920, p. 260 ff. [3] A. Alt: Aus der Araba, *ZDPV*, 58, 1935, pp. 1—78. [4] F. Frank: Aus der Araba, *ZDPV*, 57, 1934, p. 271ff.
[5] E. Robinson: *Biblical Researches in Palestine, and in the Adjacent Regions*, I. London, 1841, p. 276 f.; E. H. Palmer: *The Desert of the Exodus*. New York, 1872, p. 281.

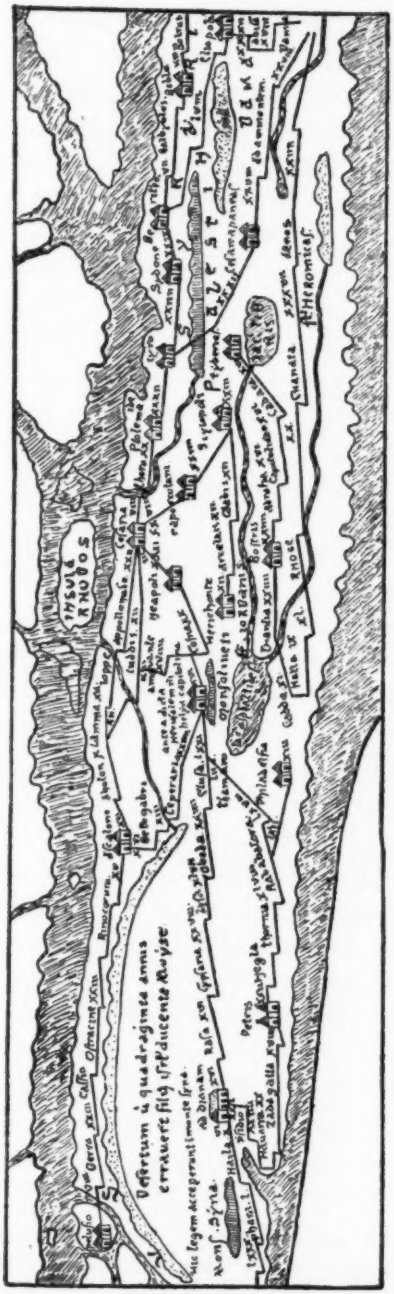

Fig. 1. Palestine on the Tabula Peutingeriana.

stations proposed by Alt, and he was consequently forced to disregard them entirely. In support of his view he says that Ad Dianam, not Aila, is marked on the Tabula as an important station, and that the road to Petra starts from Ad Dianam. In actual fact this road begins at Aila. Moreover, Alt does not seem to have noticed that the sign at Ad Dianam represents a *house* and not the double towers which usually mark an important road-station. The examination of other parts of the Tabula shows at once that a house is the usual symbol for a temple.[6] This symbol fits of course Ad Dianam and not Aila, although we do not know whether there was in reality a temple of Diana on this spot, or whether the author of the Tabula put the temple-symbol here because he understood the name thus. If our road continued from Lysa to Ad Dianam, it must have reached the 'Arava at the latter place. It follows that Ad Dianam was situated at a road fork; this was quite possibly the reason for the mistake in the Tabula, viz. the attribution of the beginning of the Petra road to that point.

A few words about Ghadhyan itself may be of interest, for it is undoubtedly the most important site in the whole 'Arava from the point of view of water supply, vegetation and cultivable land. In all this area underground water is to be found at shallow depths. Frank has already noted here many circles of stones along the wadis and it seems that Glueck was justified in assuming that these served to collect water (Pl. 1).[7] Frank and Glueck both describe the remains of an ancient fort, on which was built the Turkish police post.[8] Quite lately other remains have been discovered in the area in the course of excavating reservoirs. In one of these were found the remains of an ancient plastered pool, as well as the ruins of buildings and much Roman-Byzantine pottery. These remains were found covered by sand to a depth of over one metre and it is quite possible that other antiquities still lie buried in the ground. When the author was exploring this area on behalf of the Department of Antiquities, the ruins of another Roman-Byzantine fort were plainly visible 100 metres east of the pool mentioned above: they are also visible in the air-photo (Pl. 1). This second fort measured 30×30 m.; a wall built of cut stones is still partly

[6] K. Miller: *Die Weltkarte des Castorius.* Ravensburg, 1887, p. 93, s.v. Fano Fortuno, Fano Fugitivi (in Italy). Temples called Ad Dianam appear also in Italy, Greece, Dalmatia and Africa.

[7] Frank, *op. cit.* (supra, n. 4), pp. 240, 250; N. Glueck: Explorations in Eastern Palestine, II, *AASOR*, 15, 1935, p. 40.

[8] Frank, *op. cit.* (supra, n. 4), p. 232 f., pp. 239-240: Glueck, *op. cit.* (supra, n. 7), p. 41.

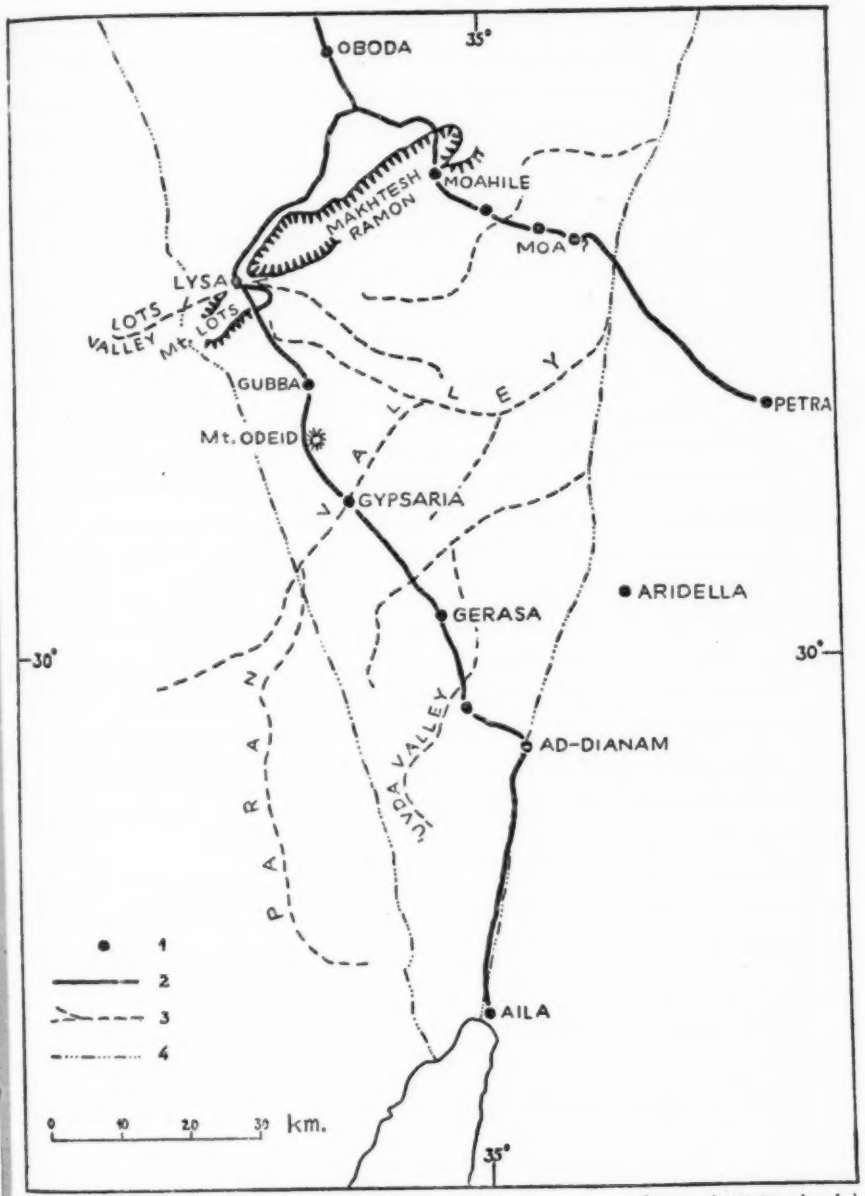

Fig. 2. The Roman roads in the southern Negev. *(Drawn by N. Warshavsky)*

1—Roman stations and castles; 2—Roman roads;
3—Valley (wadi); 4—International boundary.

extant in the south-eastern corner of the fort (Pl. 2 A), the debris of fallen corner towers can also be seen in the north-eastern and south-western corners (Pl. 2 B). All this goes to show that the site was most important both as a settlement and as a road-station and that only Aila surpassed it in the whole length of the 'Arava.

Let us now examine the Eboda—Ad Dianam road by way of the Lots Valley from the topographical and archaeological point of view. Musil has already noticed the remains of an ancient road running from Eboda by way of the Zin Valley (Wadi en-Nafḫ) to Mount Ramon.[9] At Ras el-Wabsi he noted a ruined watch-tower certainly connected with this road.[10] Frank found the remains, of buildings as well as tombs and Roman pottery along the continuation of this road in the Nitsanah Valley (Wadi el-'Ajram).[11] At the point at which this road reaches the beginnings of the Lots Valley, south-west of the top of Mount Ramon, Frank found what were apparently the remains of a watch-tower and Roman pottery, and nearby a Roman milestone.[12] Palmer too describes the ruins in the Lots Valley and, following Robinson, proposes to identify them with Lysa.[13]

From Mount Ramon the road descends in a south-eastern direction to the 'Arod Valley (Wadi Umm Saliḫ). Musil describes this road as cut in the rock to a width of 3.5-4 m.[14] Frank states that he followed a road of ancient construction from the northern Byar el-'Ideid to Ras er-Raman along which he noticed three ruins with tombs and Roman pottery.[15] The road does not, however, reach the northern Byar el-'Ideid, but turns south-westward along the high ridge of Mount Lots and follows the Karkom Valley (Wadi Umm Bureiriq). It then turns south-east towards the southern Byar el-'Ideid. Frank went along this road for six km.[16]

There exists a shorter road from Mount Ramon to the Karkom Valley which does not turn eastwards through the 'Arod Valley. This line has not been examined so far, but it seems that the distances along it correspond exactly with

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[9] A. Musil: *Edom*, I. Wien, 1907, p. 241 ff.

[10] *Ibid.*, p. 242.

[11] Frank, *op. cit.* (supra, n. 4), p. 269.

[12] *Ibid.*, p. 268.

[13] Palmer, *op. cit.* (supra, n. 5), p. 356. In his opinion the road continued through the Lots Valley and southwards to Aila by way of Kuntillet el-Jeraya and Kuntillet el-Jirafi, which he identifies with Gypsaria and Gerasa respectively. According to Palmer the distances in the Tabula fit this route; such a line, however, would not continue to Ghadhyan (Ad Dianam in Palmer's opinion too), but would reach Aila directly; moreover, the distances do not correspond closely enough with those set out in the Tabula.

[14] Musil, *op. cit.* (supra, n. 9), p. 246.

[15] Frank, *op. cit.* (supra, n. 4), p. 268.

[16] *Ibid.*, p. 267: "Wir konnten dabei zunächst für etwa 6 km. einer gebauten alten Strasse folgen, kamen dann aber nach Osten von ihr ab."

those set out in the Tabula Peutingeriana. It is possible that the road divided into two lines: one following a short but steep ascent, and one which was more convenient but longer. The Tabula marks the short distance (in the sketch-map, Fig. 2, both routes have been marked). At the southern Beer 'Odeid there are remains of a settlement and Roman pottery.[17]

The continuation of this road has been so far ascertained only in the 'Uvda Basin (Wadi el-'Uqfi), viz. at its easterne nd, within the Shaḥaruth Valley (Wadi edh-Dhil).[18] Here Musil found the remains of a fort called Qasr edh-Dhil which resembles, he says, the Roman forts found in the 'Arava. There are many windings, especially in the lower part, and there one can see much rock-cutting and walls supporting fillings.[19] It follows, therefore, that the road continued from Beer 'Odeid southwards, turned round Mount 'Odeid (Jebel el-'Ideid) from the west and ran on southeast-wards towards the Paran Valley (Wadi el-Jirafi). The exact line taken between the Paran Valley and the 'Uvda Basin can be ascertained only after a survey on the spot, because from the topographical point of view there are two to three possible parallel lines.

The remains of ancient road-cutting, the road-stations and especially the Roman milestone prove with certainty that there was a Roman road on the line surveyed above.

For the purpose of comparison, the various stations and the distances set out in the Tabula are shown in the following table:

Proposed identifications and the distances between them		The names in the Tabula Peutingeriana and the distances between them	
		Roman miles	
Jerusalem		Hierusalem	
..... 103 km.		..... lxxi	105 km.
Halutsa		Elusa	
..... 39 "		..... xxiiii	36 "
'Ovdat		Oboda	
..... 41 "		..... xlvii (xxvii)[21] .	70 (40.5)
Mount Ramon		Lysa	
..... 43 49[20]"		..... xxviii	42 km.
Paran Valley		Gypsaria	
..... 24 "		..... xvi	24 "
Wadi Ghabiya		Rasa	
..... 24 "		..... xvi	24 "
Jotbathah		Ad Dianam	
..... 40 "		..... xvi (xxvi)[21] . .	24 (39)
Elath		Haila	

[17] *Ibid.*, p. 266 f.
[18] Musil, *op. cit.* (supra, n. 9), II. Wien, 1908, p. 181.
[19] *Ibid.*, p. 182; Frank, *op. cit.* (supra, n. 4), p. 263 f.
[20] For the two possible routes, see above.
[21] Numbers in brackets are corrections as suggested below.

extant in the south-eastern corner of the fort (Pl. 2 A), the debris of fallen corner towers can also be seen in the north-eastern and south-western corners (Pl. 2 B). All this goes to show that the site was most important both as a settlement and as a road-station and that only Aila surpassed it in the whole length of the 'Arava.

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	41	"	Rasa	xvi	24 "
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	43	49[20] "	Haila		
Paran Valley					
	24	"			
Wadi Ghabiya					
	24	"			
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This table proves that most of the numbers in the Tabula correspond with reality. From Jerusalem to Oboda the distances correspond more or less; we cannot arrive at a complete agreement because we do not know the exact track of the Roman road with all its windings. Again from Lysa to Ad Dianam the 90 km. indicated in the Tabula are more or less correct. The 47 miles (70 km.) marked between Eboda and Lysa cannot be true; the actual distance is 41 km.; if we correct the number given in the Tabula from xlvii to xxvii we get the right distance. From Mount Ramon to the southern Beer 'Odeid it is 21 km. in the short line and 27 km. in the long one. From Beer 'Odeid to the Paran Valley the distance is 22 km.; thus the whole distance from Lysa to the Paran Valley is 43 km. This is the distance shown in the Tabula between Lysa and Gypsaria. It follows that we have to look for Gypsaria at the point where the road crosses the Paran Valley, where water can be found along its whole length. We might thus identify Beer 'Odeid with Gubba, the station which Ptolemy inserts between Lysa and Gypsaria. The distance between the Paran Valley and Ad Dianam-Jotbathah is 48 km., exactly as marked in the Tabula. We have therefore to look for Gerasa at the spot where the road crosses the Wadi Ghabiyu near eth-Thamila. The distance given in the Tabula between Ad Dianam and Aila, viz. 16 miles (24 km.) cannot be right. We must assume that the number xvi repeated three times must be wrong. Because of the temple shown at Ad Dianam there was not enough space left between it and Haila and so the vi of the numeral had to be written above the x in this form: $\frac{\text{vi}}{\text{x}}$. The right distance is xxvi Roman miles and it seems that the original numeral was $\frac{\text{vi}}{\text{xx}}$ and that one x has been omitted or erased by mistake.

To sum up: it seems that apart from two mistakes, which can be easily explained, all the distances in the Tabula Peutingeriana can be made to fit the actual distances in the line which we have traced as that followed by the Roman road to Elath.

Notes on Ancient Agriculture in the Central Negev*

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INTRODUCTION

In the following, an attempt is made to indicate some ecological and agronomic aspects of ancient agriculture in the Central Negev during the Nabataean and Roman-Byzantine periods. The area investigated in 1945-46 covered the region bordered in the north by the Nitsanah-Mashabim road, in the west by the Israel-Egypt border, in the south by Mount Karkom and the Paran Valley, and in the east by the Meishar, the eastern margin of Makhtesh Ramon, and the Zin Valley.

TOPOGRAPHY, GEOLOGY AND SOILS

The Central Negev is composed of a central mountain block lying on both sides of the large anticline of the Makhtesh Ramon, which runs in a SW-NE direction.

The northern escarpment of this block, some peaks of which, such as Mount Ramon, attain heights of 1000 m. and above, gradually slopes down towards the plain of Mashabim-Nitsanah. In the west, it slopes down to the plains of Qusseima-Kuntilla. South of Makhtesh Ramon, there are some more groups of high mountains, such as Mt. Sagi, Mt. 'Arif and Mt. Karkom, all of which slope down towards the Paran Valley. In the east, there are the valleys of the 'Aravah and of Zin. Makhtesh Ramon, which divides the Negev highlands, is a prominent feature in the morphology of the Negev.

In general, the Negev highlands are made up of limestone and of chalk and marl formations of the Upper Cretaceous and Eocene. In addition, Makhtesh Ramon and certain other areas contain Nubian sandstone, basalt and gypsaceous marls of Lower Cretaceous, Jurassic and Triassic age. The valleys

* This paper has been published in Hebrew in *Eretz-Israel*, 2, 1953, pp. 94-97.

extending at the feet of the mountain block, and especially to the south of it, also contain some Neogene formations.

There is a very pronounced difference in the appearance of hills and valleys according to whether they slope north to north-west or south to east. North of Makhtesh Ramon and Mount ha-Ma'arah, the mountain and hill country has a steppe-like character. The soil of the valleys and plains of this section is loess. Following the course of the main drainage channels there are to be found more or less flat strips of land, with loess soil, which may be up to a few hundred metres wide. Similar strips of loess accompany the minor wadis, but here their width is much smaller. There are a few wide plains of loess at the transition from the highlands to the Mashabim-Nitsanah Plain. On the other hand, the area south of Makhtesh Ramon is taken up by hilly desert country, covered with rocks and sterile hamadas. The wadi-beds here are completely devoid of loess.

PLANT LIFE

The elevated mountain ridges north and west of Makhtesh Ramon, as well as the adjoining escarpments running north and west, from 600 m. upwards, form an enclave of Irano-Turanian vegetation mainly occupied by the *Artemisietum Herbae albae* association. Northwards, where the highlands slope down to the Mashabim-Nitsanah Plain, this is replaced by Saharo-Sindian vegetation. Makhtesh Ramon proper, as well as those parts lying to the south of it and the escarpments overlooking the valley of the 'Aravah, sustain only a very poor vegetation, of Saharo-Sindian character.

CLIMATE

Climatic data for the region are extremely scanty, and discussions of climate must therefore be based mainly on the natural vegetation. Lately, attempts have been made by the Meteorological Service of Israel to measure rainfall amounts by means of totalizers. By analogy with other regions, mean annual rainfall amounts of 100-150 mm. may be expected in the area of the Irano-Turanian enclave. The highest mountains may receive rainfall amounts in excess of these figures.

South of Makhtesh Ramon the rainfall seems to be extremely slight, as is apparent from the sterile hamadas and from the confinement of perennial plants to hollows.

As in other deserts, yearly rainfall amounts and the distribution of rainfall through the rainy season are subject to considerable variations.

DISTRIBUTION OF AGRICULTURAL LAND IN THE PAST

To the south of the Mashabim-Nitsanah road, along the slopes of the hills up to the northern escarpment of Makhtesh Ramon and Mount ha-Ma'arah, there are to be found remnants of former agriculture, as well as fields cultivated by the Beduin in a primitive manner. The eastern limit of this area of agricultural cultivation extends from the Maḥmal Pass at the north-eastern tip of Makhtesh Ramon along the upper part of the slopes stretching from 'Ovdat Plateau to the Zin Valley, east of 'Ovdat and the Zin Pass. The western limit is on the slopes of the highlands within the boundaries of Sinai. The Egyptian border prevented us from determining the exact limit of cultivation in this direction. We know, however, that the cultivated area continues into Sinai to the vicinity of Kadesh Barnea and the lower reaches of the Lots Valley, while the whole region lying between Quseima and Kuntilla is an hamada-covered desert, with no traces whatever of cultivation. It is evident from these data, that cultivation is confined to the Irano-Turanian region, except at the north-western margin of the hill region, in the direction of Shivṭah and Nitsanah, where it includes some areas of a Saharo-Sindian character.

TYPE OF CULTIVATION

The visitor touring the Central Negev will be struck by the fact that former cultivation was almost completely confined to wadi-beds and hollows, while the cultivated fields proper are but strips or patches, making up only a small fraction of the total area. They are easily recognized by their terraces or remnants of terraces. The fields of the Beduin, with their primitive cultivation and terracing, largely coincide with these remnants and are similarly confined to wadi-beds. Striking illustrations of this agricultural landscape may be seen in the Zeitan Valley in the vicinity of Shivṭah, as well as in the 'Ovdat, Zin, Nitsanah and Lots valleys, and their numerous tributaries. The following circumstances have brought about this landscape of scattered patches of cultivation:

(1) From the edaphic point of view, the general character of the region is one of rocky hills and mountains, devoid of any continuous soil cover. Loess soil, of such depth and continuity as will make it suitable for agriculture, is confined to the valleys and plains of this region.

(2) As a result of the extreme climatic conditions and the low rainfall characteristic of the area, the existence of agriculture, in addition to being dependent on the properties of the soil, is subject to topographic influences. Successful cultivation is possible only at such places as have their rainfall supplemented by appreciable amounts of runoff water, draining from higher-lying, uncultivated fields.

The ancient agriculturist was undoubtedly aware of the importance of exploiting runoff water, the basic principle in modern dry-farming. The beds of the main wadis, as well as their subsidiary drainage channels, are the chief areas which can benefit from water running off the adjacent slopes or from floods occurring in the wadi-bed itself. It is likely that this consideration, more than any other, prompted the farmers of old to confine their efforts at cultivation to the valley-bottoms between hills and mountains, in spite of the large amount of work involved in their terracing. At the same time, there is almost no cultivation in the different plains and plateaus, such as the Lavan Valley or the Maṭred Plateau.

In order to make possible the use of runoff water for the irrigation of valleys, there was developed an elaborate culture of terrace- and dam-building, and the visitor to these places cannot fail to be greatly impressed by the solid and perfect construction of these ancient terraces, and by the great amount of work expended on their erection. As a rule, the terrace walls are made of consecutive layers of stones, roughly hewn to a rectangular shape of about 20-50×30-80 cm. They generally comprise two parallel walls of such stones, with a filling of smaller stones between them.

The terrace-walls and dams in the river valleys served several purposes:

(1) Interception and storage of water, whether derived from rainfall or from runoff.

(2) Control of soil erosion.

(3) Formation of plots of flat ground, which will ensure uniform distribution of water, at the same time preventing overflow and collection of excessive amounts of water in a small number of hollows.

Attempts at reconstruction of ancient methods of terracing meet with considerable difficulties, because a large portion of these works, and particularly those of the smaller valleys, have been obliterated in course of time, and their soil eroded. The Beduin who have based their primitive agriculture on the ruins of the ancient terraces have blurred the picture still further. Only in a few places

did we find samples of ancient cultivation which were almost intact and enabled us to deduce the methods of terracing employed elsewhere. A distinctive feature of these methods is their relation to the morphological character of the field concerned. Our observations seem to indicate the existence of two main types of terracing and cultivation:

(1) Cultivation in tributary valleys.

(2) Cultivation in the major drainage channels.

(1) CULTIVATION IN TRIBUTARY VALLEYS

As already pointed out above, there are to be found within the limits of agricultural cultivation in the Central Negev numerous subsidiary valleys containing layers of loess. The ancient agriculturists cultivated these by constructing a series of stone-dams stretching across the total breadth of the valley. By this means, the valley is split up into a series of level plots, each somewhat elevated above its neighbour, from which it is separated by a stone-wall. Within the limits of each terrace, the river-bed proper was obliterated so as to ensure perfect levelling. This type of cultivation has been well preserved in the tributaries of the valleys of 'Ovdat, Nitsanah, Elah, Zin and a number of other places (see Plate 3 A,B).

The width of the terraces, which are either rectangular or square, ranges between a few metres, in the upper reaches of the valleys, to 50-100 metres in their lower parts. Their length is a function of the slope and of the height of the terrace-wall. As a rule, they are as long as they are wide. The height of the walls, too, shows variations from place to place, although 1.5-2 metres are only rarely exceeded.

It should be pointed out that this method of cultivation, which involves the repeated obliteration of the river-bed, must be applied beginning with the highest sections of the wadi, for only by this means can the risk of floods and inundation be averted in the lower part of the valley. One of the tributaries of the 'Ovdat Valley, where this method of cultivation was investigated, had strips of cultivated land stretching along all of its branches almost to the watershed on the Maṭred Plateau.

Examination of aerial photographs showed similar conditions to prevail at numerous other localities. It is evident that once terracing is completed, the flow of water in the river-bed comes to an end, while the runoff-water collecting on the adjacent rocky slopes on both sides of the river-bed is more or less

uniformly distributed. Each cultivated terrace thus enjoys a supplementary supply of water deriving from two strips of slope, of about the same width as the terrace proper.

From the agricultural point of view, we were able to show that this practice ensures yields even in rather dry years. At the few locations where we encountered well-preserved terraces, we found that the Beduin, who cultivate them at the present time, obtained good yields of wheat and barley, even in dry years, such as 1946, a year which was generally characterized by very poor yields, and left the Negev highlands even without its usual cover of ephemeral spring vegetation (cf. Plate 3 C). Only in years suffering from total lack of rain no crops grow in these valleys.

(2) CULTIVATION IN THE MAIN VALLEYS

The main difference between the terracing applied in the valleys of the major wadis and that described above for their tributaries is due to the inability of the cultivator to control the wadi proper. While the water course of tributaries is completely dammed up by terrace-walls, that of the major wadis, covered as it is by stones and pebbles, is not interfered with. Instead, the cultivator devotes himself to the cultivation of the flat and somewhat elevated strips of land which stretch along both sides of the wadi (Plate 4 A). The extent of these areas of calcareous loess greatly exceeds that of the corresponding strips occurring in conjunction with small wadis. They may reach a total width of several hundred metres.

In these locations, it is usual to find on each side of the wadi a row of rectangular plots, each plot surrounded by a stone-wall. The terrace-walls proper run perpendicular to the direction of the wadi, dividing the land into a series of level terraces. Solid walls of stone are built along the line of contact between the wadi proper and the fields. These serve to protect the soil from erosion by flood water flowing through the wadi. Occasionally, there are remnants of additional walls, separating the fields from the adjacent slopes.

The extent of individual plots exceeds that of corresponding plots in minor valleys, reaching 100 m. and more. The type and arrangement of the walls seem to indicate that here, too, the farmer of old attempted to eliminate the natural slope of the land, and transform it into level plots. In wide sections of wadis, as well as in cases of rather steeply sloping valleys, we found 2-3 longitudinal terraces on each side of the wadi.

The terrace-walls, particularly those separating the fields from the water course, are very solidly constructed. In the Zin Valley, near 'Ovdat, as well as in the Lavan Valley, we found walls of this kind which were 1-2 m. thick. The breaking up of the land into rectangles used to be practised even in level regions, such as the Lavan Valley. There, the dividing walls comprise only one to two layers of stones, while the terrace-walls in the Zin Valley reach a height of 2 m. and more.

We cannot as yet state definitely what measures were taken to harness the flood waters in these regions. In some places the terraces border on rocky hills, thus receiving runoff water from the adjacent slopes. In other places again, the supplementary water supply is ensured by the terraces lying slightly below the general level of the land. However, in the Boqer Valley, as well as in the valleys of Zin and Lavan, there exist numerous terraces which are remote from slopes, and at present do not receive supplementary runoff-water. These fields are not cultivated by the Beduin. Yet their meticulous fencing-in and terracing constitute convincing evidence of their former use. There is thus reason to assume that the Nabataeans and Byzantines learned, or perhaps discovered, ways and means for the use of flood water running in the wadis, and for its diversion to serve as supplementary irrigation for their fields. In a single instance, in the Lavan Valley, we found remnants of an ancient dam, but owing to the havoc wrought by soil erosion its use is not yet quite clear. Even at the present time, flood water is used by Beduin who dig ditches from the river-bed to their fields, where the water spreads. In the Zin Valley we even found an elaborate system of dams and deep ditches built by Beduin, yet they extended for a few metres only.

Cultivated areas of the type here described were found by us in almost all the large wadis crossing that section of the Negev highlands which is lying within the limits of agricultural cultivation. The following will serve as examples: the Zin Valley near 'Ovdat (cf. Plate 4 B), the lower part of the Ḥorshah Valley, the central section of the valleys of Nitsanah, Elah, Boqer, and Revivim. The presence of cultivated areas in the large bends of the Nitsanah and Elah valleys deserves special mention.

THE CULTIVATED PLANTS

We have no reliable information concerning the cultivated plants of ancient times. However, observation of present Beduin usage should yield us valuable

clues. Beduin farming consists mainly of field crops and pasture. Garden crops are almost unknown. At present barley is the chief cereal grown (Plate 4 C), followed by wheat. In a few places we came across fields of lentils.

According to Palmer (1871), there used to exist some orchards of apples, pomegranates and vines in the vicinity of Shivṭah. Woolley (1914-15) and Canaan (1928) found a few olive trees in the Zeitan Valley, near Shivṭah. In addition to these, vines, apple trees, pomegranates, olives, figs and sycamores are known to grow in the Mitnan Valley, close to the Ḥorshah Valley. These facts, in conjunction with remnants of winepresses, reported by Palmer (1871), certainly corroborate the suggestion that at least some of the ancient terraces, and particularly those of the minor wadis, were formerly devoted to the cultivation of orchards.

TELEILAT EL-'ENAB

In a number of places within the region here considered, there exist more or less extensive stretches of land on which are scattered, in an orderly manner, heaps of small stones, locally called *teleilat el-'enab.*

We visited two such areas. The first and smaller centre lies close to Nitsanah where it occupies only a few hectares. The second, much larger centre, is in the area of Shivṭah and the Lavan Valley. Along the margin of the wide valley associated with this wadi there are scores of hectares covered with teleilat el-'enab. The northern outposts of this centre are found at the foot of the hills of Mitspeh-Shivṭah, at Shivṭah and in the Zeitan Valley. Palmer (1871) states that stone-heaps resembling teleilat el-'enab also occur in the vicinity of the 'Ovdat Valley, but we were unable to locate them in spite of our efforts to do so.

The heaps are composed of flint or chalk stones and generally attain a height of 30-70 cm. The outer layer of the heap is made up of stones only, all the rest being mixed with soil. At the margins of the Lavan Valley we observed a number of elongate heaps, as well as some series of longitudinal ridges of stone.

In the Lavan Valley, which appears to be the most important centre of teleilat el-'enab, the heaps seem to be regularly confined to the rolling hamada plains at the foot of the surrounding hills, thus forming a girdle around the loessy soils in the central part of the valley.

Although it is difficult to give a satisfactory explanation of the use of these stone-heaps, there can be no doubt that their extensive occurrence in close vicinity to loess soils and remnants of past cultivation indicates their agricul-

rural affinities. The natural vegetation of the stone-heaps is identical with that of their surroundings. In both, the dominant perennial is *Zygophyllum dumosum.* All our efforts to find remnants of vines or other cultivated plants were in vain.

SUMMARY

1. It may reasonably be assumed that, in spite of the prevailing arid climate, the ancient inhabitants of the Negev maintained a more or less stable agriculture by harnessing runoff water for the irrigation of their fields. Cultivation was confined to valleys, which were covered by loess and were conveniently situated topographically for the use of runoff water as supplementary irrigation. The harnessing of runoff water was achieved through the erection of elaborate systems of dams and terrace-walls. It seems probable that winter cereals sown in these ancient fields grew well even in rather dry years. In addition, fruit trees seem to have been cultivated, as indicated by isolated fruit trees occuring today, and by remnants of winepresses.

2. The problem of teleilat el-'enab is discussed.

3. The ancient agriculture of the Central Negev, confined within the region described in this paper, is a natural agricultural unit, clearly demarcated from the southern section of the Negev, which has always borne the stamp of an extremely arid and barren desert. The Northern Negev seems always to have been an area of unsettled extensive agriculture, as it is today.

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Haifa:
A Study in the Relation of City and Coast

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THE origin and growth of a port nowadays are not so dependent as they once were on natural factors, such as an embayment protected from wind and waves, and deep-anchorage facilities. But even nowadays, when engineering can substitute or create most of the conditions necessary for the harbouring of larger ships, and more and more ports are artificial ones,[1] some natural factors still remain of prime importance and, as it were, predestine certain places on the coast to be major ports. These factors are first and foremost those of location and situation—i.e. accessibility from the interior and an advantageous position in relation to other coasts and ports.[2] This applies especially to the East Mediterranean coast which is so little indented and where the use of the few embayments is largely impeded by the configuration of the land-surface behind. Only the combination of a good-sized bay with easy access to most of the country behind provides the conditions for a port of the first rank in the Levant. Such a combination exists in only two places on the East Mediterranean coast; and one of them is Haifa.

THE COAST OF PALESTINE AND ITS CONFIGURATION

An outstanding characteristic of the geography of Palestine is the great variety to be found in so small an area. This statement applies to the coast as well. Although comparatively short, it too exhibits at least two major types:

(a) a straight coastline of aggradation, i.e. one formed by marine deposition, beginning to the west of the Nile Delta;

(b) a slightly indented, rocky and rugged coast, beginning some kilometres south of Haifa and extending as far as the Taurian coast of Anatolia, i.e. northwards to the Gulf of Iskanderun (Alexandretta) with these characteristics becoming increasingly pronounced.

[1] Mecking, 1930, p. 327 (cf. Bibliography at end of paper).

[2] Mecking, 1931, p. 1.

The aggraded coast comprises more than three-fourths of the coastline of Palestine. From the outlet of Wadi el-'Arish, the traditional boundary of Palestine to the south-west, to the Cape of Carmel, where the second type of coast becomes more pronounced, the length of the coastline is about 225 km. From Rafah on the Egyptian border to the Cape of Carmel the length is ca. 190 km.

The first third of this aggraded coast takes the shape of a gentle curve running SW-NE. Further north its direction becomes almost meridional. The coast runs roughly parallel to the general trend of the anticlinal axes of the mountains of the Negev, Judaea and Samaria. From the morphogenetic point of view this coastline represents the fringe of a littoral borderland that emerged from the sea in the near geologic past, and became welded to an already existing and consolidated oldland. This coast is not everywhere low. South of Tel Aviv a beach of 200 m. width and more is generally interposed between the shoreline and the cliffs, marking an older coastline. In places the beach is almost absent and the cliffs drop straight into the sea. In the Sharon, north of Tel Aviv, the cliff-coast becomes prevailing: the beach is seldom more than 20 m. wide and sometimes completely absent. These cliffs occur where ridges of dunes consisting mainly of Kurkar-rock[3] meet the coast obliquely. There is a strong surf along all the coast caused by the prevailing west winds. They cause strong wave action coming over wide stretches of open sea. The cliffs therefore are continually receding and produce all the symptoms of active wave-action: wave-cut notches and benches, pocket beaches strewn with Kurkar blocks, products of collapsing cliff-fronts etc.

In order to explain the aggradation of the greater part of the coast of Palestine with its even course, it has been assumed[4] that this configuration is mainly due to the deposition of sands brought and distributed along the coast by an offshore current. This current is assumed to be part of a closed current-system that follows the coast of the Eastern Mediterranean Sea along all its extent. Moving counter-clockwise along the coast of Egypt this current is assumed partially to absorb and transport sands and other sediments brought into the sea by the Nile.[5] Turning north with the coast of Palestine it deposits and distributes most of the sand-load along this coast, thus causing its extensive aggradation.

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[3] Kurkar is according to Picard, 1938, p. 9, 'a diagenetic, hardened, calcareous sandstone of marine, or of terrestrial origin (older Dunes) distributed in the coastal plain. It is mostly considered as of Pleistocene age, but its formation may take place even within recorded time.'

[4] Adler, p. 28. [5] *Ibid.*

But there arise doubts as to the feasibility of this process, especially as to whether this current, which is thought to consist of two branches,[6] can be responsible for even a part of the aggradation proper. It may be questioned too, if there is any sand supply by the Nile at all—especially in recent geological times.[7] The current itself along the Palestinian coast is still one of the minor problems of the Eastern Mediterranean. The information concerning its course, width, rate of movement, temperature and salinity is very vague and scanty. According to Nautical Manuals,[8] its velocity is at best one knot per hour in the winter—and even this only with strong west winds. It seems, therefore, that the capacities commonly attributed to this current of transporting, accumulating and in particular distributing and aggrading, are greatly overrated.

Others assume that the Palestinian coast was subject to vertical movements even in historic times, with the southern part of the coast as far as Jaffa still emerging and the northern part subsiding. This would in their opinion[9] satisfactorily explain the shallowness and straightness of the southern portion of the coast and the very different aspect of the northern part with its receding cliffs and the submerged harbour-works in Caesarea. This opinion is nowadays subject to strong opposition from geologists.[10]

There remains another possibility. It has been suggested[11] that the chief cause of aggradation of the southern part of the coast is a process of beach-drifting, brought about mainly by wave-action caused especially by the W and SW-winds,[12] whereas a longshore-current is responsible for the sand supply, and even that only partly. As with so many aggraded coasts, here too the longshore current may

[6] Rim, p. 38.

[7] There are doubts too whether this offshore current transports sands derived from the Nile in recent times and not those derived from the submerged Pleistocene Delta of this river, especially its Pelusium branch. Moreover there may exist another, more important supply-source: recent and in an even larger degree Pleistocene sands of the Wadi el-'Arish (according to a suggestion Prof. Avnimelech made to the author). Similar doubts concerning this assumed current and its role at the Mediterranean coast of the Sinai are expressed by Awad (p. 221): 'Est-il dû aux-alluvions, pourtant quelque peu lointaines du Nil, transportées par un courant marin venu de l'Ouest? Est-il dû au contraire aux alluvions de l'Ouadi El-Arish transportées par un courant venu de l'Est? Ou bien aux deux?'

[8] *Mediterranean Pilot*, 1937, p. 27, and *Mediterranean Pilot*, 1925, p. 47.

[9] Range, 1922, p. 20; *id.*, 1932, p. 60.

[10] Picard, 1943, p. 101, refutes the opinion that tectonic movements occurred on the coast in recent times. Avnimelech, p. 40, maintains that the whole of the coast of the country has been subject to continuous subsidence during Quaternary and recent times.

[11] Adler, p. 32.

[12] These winds reach very high frequency, the more so when lighter winds are discarded. They, therefore, cause the most frequent and strongest waves, having the greatest fetch by blowing unobstructed over wide expanses of sea.

at most cause the accumulation of sand. The beach-drifting,[13] however, could account entirely for the process of aggradation proper.[14]

Whatever the causes of aggradation and cliffing may be, they bring about a coast of the poorest horizontal differentiation, i.e. of very slight interpenetration of sea and land. There are no islands or even islets along it; only 'sea rocks', i.e. partly inundated tiny remnants of a wave-cut platform, dismembered by abrasion. The further north, the larger and more frequent become these reefs, rendering the coast still more difficult of access to shipping. The coastline runs straight, without any indentations as far as Jaffa. Here a little knick of the coastline together with a larger number of reefs—among them the famous Andromeda Rock—were the natural basis of the ancient port of Jaffa, the town that existed according to ancient tradition even before the deluge.[15] North of Jaffa the coast not only becomes thoroughly cliffy, with an increasing number of reefs but there also appear slight indentations. One of these, at Dor (Tantura) forms a little cove. Here too, as in the case of Jaffa, a sort of harbour originated not so much on account of the indentation, as of a group of several reefs running in an S-shaped row for about ¾ km. and forming a kind of natural breakwater for a shallow pocket-beach. The use of this tiny harbour which had some minor importance in ancient times is at present very limited, the place serving only as an occasional harbourage for fishing-boats. Eleven kilometres farther north, a still larger indentation of about 800 m. length and 400 m. width forms the Bay of 'Atlit, the site of the port and sea fortress of Crusader fame (Castellum Peregrinorum). In the light of modern requirements for a harbour there is no prospects of 'Atlit becoming a major port, especially in view of its proximity to Haifa.

THE SYRIAN COASTAL TYPE

From Cape Carmel, where the coastline turns suddenly ENE and then ESE, there begins the second type of configuration of the Palestinian coast. From the typo-

[13] This beach-drifting is caused by waves running up obliquely to the shallow coast and returning at a right angle. This enables them to displace continuously considerable masses of sand particles, to carry and distribute them along the coast, and thus straighten its course. They may even initiate long-shore currents which considerably contribute to the process of straightening the coastline.

[14] Kuenen, p. 275. It may be mentioned in this connection that some English geomorphologists (J. A. Steers and W. V. Levis) insist on the prime importance of wave action in forming most of the aggraded parts of the coast of South England. They negate the role of long-shore currents, which until now were thought of as the prime agent in forming this type of the coast of England, denying even the existence of these currents along the shore in question; cf. Taylor, p. 174.

[15] Plinius Secundus: *Naturalis Historia*, V, 69.

logical point of view, the sector of the coast that forms the Haifa-Acre Bay, can be described as a 'diagonal coast'. The mountain-massif of the Carmel, whose extension is prolonged to the NNW for two kilometres by a series of submarine rocks,[16] runs out into the sea at an angle of about 60°. The coastline behind the mountain cape recedes then inland in a mild curve to form the bay.

Certain peculiar tectonic and geomorphological features characterize the Syrian coast. Adler,[17] to whom we owe the only geomorphological analysis of the Palestinian coast, termed it therefore the 'Syrian Coastal Type'. According to him, the Bay of Haifa too belongs to this configuration, as does in his opinion even a portion of the coast to the south, as far as Dor. The Syrian-Lebanese coast, the prototype of the 'Syrian Coastal Type', owes its major configuration to faulting and foundering processes that occurred parallel to the meridional flight of the Great Rift Valley including the Beq'a and the Ghab.

What are the characteristics of the Syrian Coastal Type from the morphographic point of view? Their most important feature is that mountain-ranges run parallel to the coast at a short distance from it, as in Lebanon, or for long stretches directly bordering it, as in the middle and northern part of the Ansariyeh Mountains, Jebel Aqra (Mons Casius) and the Qizil Dagh (Amanus). From these ranges there branch off short spurs, caused mostly by faulting, which project almost straight into the sea. These spurs form a series of short steep headlands along the coast: Rosh ha-Niqrah (Scala Tyriorum of the ancients), Ras el-Abiad (Promontorium Album), Ras en-Natur, Ras Sheqqa (Theou-Prosopon), Ras el-Basiz (Posidion), Ras el-Khanzir (Rossicus Scopulus) etc. Between these promontories the generally straight coastline bends inward, forming a corresponding series of gentle curves that at longer intervals enlarge to veritable embayments: St. George's Bay, Bay of Juniyeh, Bay of Aqar, Bay of Antioch. The promontories divide up the narrow coastal plain in a number of very small compartments, locked in by mountains to the east and separated one from the other by the headlands. Only in a few instances the coastal plain broadens and extends to more considerable meridional length as in the case of the Plain of Aqar. These small alluvial plains are locally known as 'sahel' and are particularly characteristic of the Lebanese coast; they become progressively smaller towards the north.

In strong contrast to this configuration stands the relatively independent Carmel-massif, which as already mentioned meets the sea at an acute angle—the

[16] Spartan Reef and Carmel Reef of the Admiralty Charts.

[17] p. 11.

only such major occurrence along the Palestinian-Syrian coast. Along all the coast, only this mountain forms a major headland.[18] Important too, as will be shown later, is the fact that Haifa Bay is the submerged westernmost part of the E-W directed series of depressions: the plains of Beth Shan, Harod and Jezreel. On the Syrian coast, there exists only one adequate counterpart to this: the depression of Kebir to the north of Tripoli, the Bay of Tripoli, however, being a much poorer site for a harbour than Haifa Bay. Only from these two embayments, each with a sequence of broad valleys behind, there is easy access to the interior. The remainder of the coast has very poor facilities for communication with the inland areas.

THE DEPTH CONDITIONS ALONG THE PALESTINIAN-SYRIAN COAST

The depth conditions as illustrated by the submarine contours (isobaths) along the coast of Palestine and Syria[19] are an additional reason for considering the Bay of Haifa as only a transitional stage to the Syrian Coastal Type. Their course, spacing and pattern contributes to the inhospitality of this coast not less than the lack of natural harbours.

Along the Palestinian coast there extends a submarine shelf[20] of only moderate width. In the SW where the coast forms a great curve, the width is considerably greater than along the meridional part of the coast.

COMPARATIVE TABLE OF DISTANCES FROM THE SHORE OF SOME SIGNIFICANT ISOBATHS ALONG THE PALESTINIAN-SYRIAN COAST

Palestine	Distances in km.			
	200 m.	100 m.	50 m.	20 m.
W. el-'Arish (mouth)	45	35	24	8
Rafah	31	27	15	4
Ascalon	25	18	12.5	1.5
Jaffa	18.5	15	10	1.3
Mouth of the Hederah River (32°30' N)	17	12	7	1.5
Cape Carmel	12.5	11	10.5	1.7
Haifa Bay (opposite the outlet of the Qishon)	19	17	15	3.5
Between Rosh ha-Niqrah and Achzib	5.5	3.5	2.5	1

[18] Woolley, p. 180.

[19] The following data are derived from the Admiralty Charts listed in the Bibliography and from Rosenau's *Fishermen's Chart*.

[20] As the limit of the shelf-zone the conventionally used 200 m. isobath will here be applied, although actually the 125 m. isobath is much more suitable to assume this function for the greater part of our coast.

Lebanon-Syria

	Distances in km.			
	200 m.	100 m.	50 m.	20 m.
Tyre	11	8	7	1
Beirut (port)	4	2	1.5	1
Ras Sheqqa	2.5	2	1.8	0.9
Tripoli (the port el-Mina)	9	4.5	4	2
Latakia (to the SW)	4	2.25	1.8	0.25

The mean width of the shelf is about 23 km. for the southern part of the Palestinian coast (Rafah-Jaffa) and ca. 14 km. for the northern part (Jaffa-Rosh ha-Niqrah). A sort of transition appears already west of the outlet of the Hederah rivulet where the 200 m. isobath begins to run much nearer to the coast than hitherto, and continues so until a little distance south of Rosh ha-Niqrah. From Rosh ha-Niqrah to the north the course of the isobaths changes thoroughly. They not only run in considerable lesser distance from the shore (cf. Table), their course too becomes boldly curved—in very strong contrast to their general straightness even along the northern coast of Palestine. They follow closely the course of the Lebanese-Syrian coast at times emphasizing in a very pronounced way its projections and recessions, narrowing their relative distances especially at the steep promontories—an isobath-pattern typical of a coast conditioned mainly by faulting.

THE BAY OF HAIFA

Cape Carmel has already been referred to as the boundary of two different types of coastal configuration, although the inclusion of the Bay of Haifa in the Syrian coastal type may be questioned. The bay itself has the form of an half-oval extending in a SW-NE direction, with its broad basis in the SW and a small curved apex in the NE. The length of the bay-coast from Ras el-Kurum to Acre is 20 km., or 12.3 km. as the crow flies; the greatest width of the bay is about 5 km.

The depth-conditions inside the bay are as follows:[21] the 10 m. isobath runs at a mean distance of 750 m. from the land; the 5 m. isobath at about 300 m. (the equivalent distances in the Bay of Beirut near the port are: 400 m. and 200 m.). The course of these isobaths in Haifa-Bay is on the whole regular and straight in the SE-part of the bay. In the northern waters of the bay there appear a number of long, narrow shallows, the biggest of which are shown on the Admiralty Chart as Talbot-Reef, Foxhound-Reef and Acre-Ledge, the latter being a submarine prolongation to the south of the small cape of Acre. Apart from this, the depth

[21] Cf. Rosenau: *Fisbermen's Chart*, sheet: Ras en-Naqura-Jaffa, and Admiralty Chart No. 1585.

Fig. 1. H

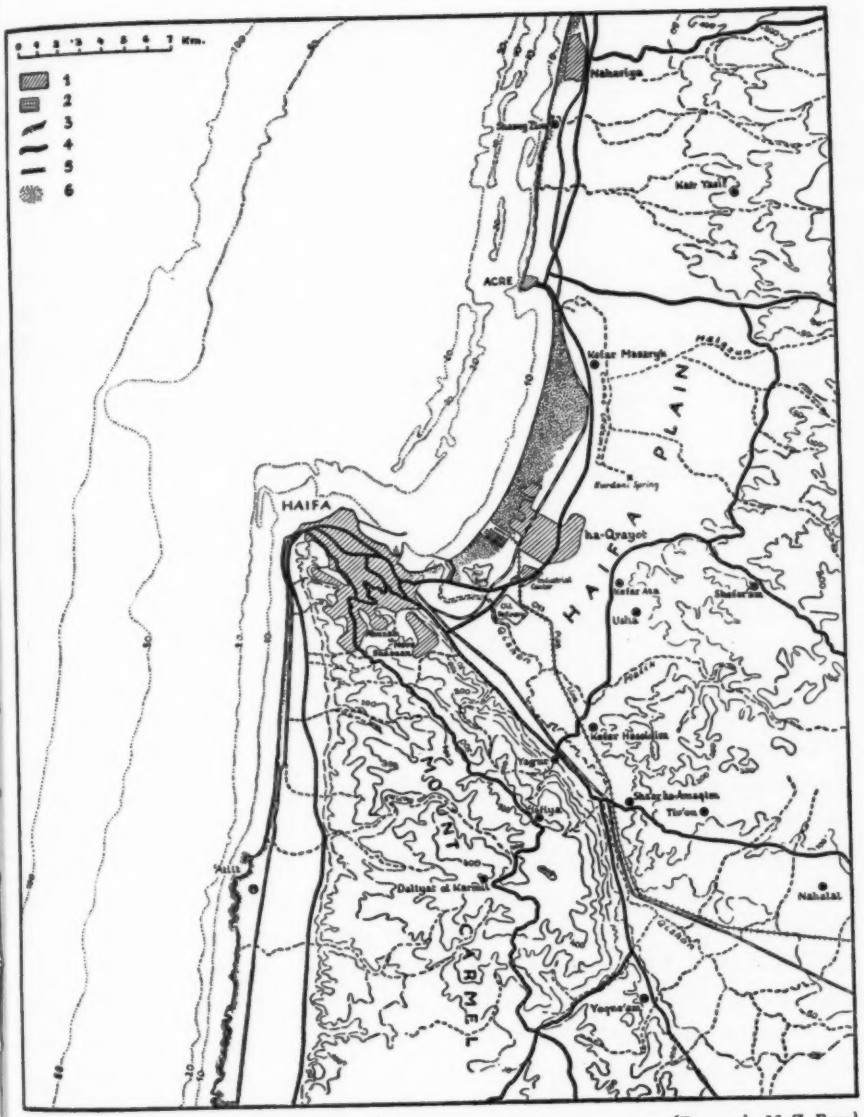

Fig. 1. Haifa and its surroundings. *(Drawn by N. Z. Baer)*

1 Towns
2 Oil tanks
3 Coastal cliffs
4 Main roads
5 Railway
6 Sand area

(By Permission of the Director, Survey of Israel)

in the northern part of the bay is very irregular and changes continuously, quite in contrast to the southern part. There is no doubt that the northernmost part of the bay is relatively swiftly filling up with sands and other sediments—one of the main reasons why Acre, once the leading port, has lost all importance as an harbour.

The origin of the bay is due to ingression of the sea upon a former land-area which subsided along fault-lines running NW-SE. There is geological evidence that the sea extended much further inland in the not too distant geological past, covering the Haifa and Acre Plains in the Pleistocene.[22] There is evidence too that all this area is now in the process of emergence. Intensive alluviation and marine sedimentation are accelerating the filling up of the bay.

CLIMATIC CONDITIONS

In contrast to the harbours of the Atlantic and its adjacent seas, where fog and ice are of prime importance,[23] there is only one climatic factor to be taken into consideration with the harbours of the Eastern Mediterranean: the winds. The degree of protection from winds is thus one of the most important criteria for the site of a harbour in this region.

The wind-frequencies in Haifa-Bay as recorded at Acre[24] show a marked shifting of the main wind directions in the half-year periods April-September and October-March, which in Palestine correspond roughly to summer and winter. In the first mentioned half-year there is a marked preponderance of winds from the western quarter: their frequency is 67% (W: 25%; SW: 24%; NW: 18%). Winds from the eastern quarter amount to only 9% (E: 2%; SE: 5%; NE: 2%), while winds from the north total 10% and those from the south 8%. The percentage of calms in this period is 6%. During the winter season the frequency of winds coming from the western quarter decreases considerably, amounting to only 27% (W: 9%; SW: 11%; NW: 7%), whereas the frequency of winds coming from the east increases to 39% (E: 8%; SE: 25%; NE: 6%). Winds blowing from the south amount in this period to 16% of the total, those from the north to 7%. The mean windforce is relatively small, seldom exceeding Beaufort 6, and averaging as a whole between Beaufort 2-3. The most frequent high winds

[22] Picard, 1943, p. 91 ff.

[23] In the whole of the Mediterranean tides are of no importance. The normal tidal variation in the southern part of the Bay of Haifa amounts to 30 cm. with maxima of 40-47 cm.

[24] Data derived from the three sheets: 'Acre. Wind-Roses, 1931-1940' (0600, 1200, 1800 GMT) supplied by courtesy of the Director of the Israel Metereological Service.

blow from E and SE, whereas the strongest winds experienced at Haifa blow from the SW in the winter season.

THE SITUATION OF HAIFA PORT

It is evident thus, especially from the wind- and depth-conditions, that only the southern part of the Haifa-Bay, situated in the lee of Mount Carmel, has some of the natural prerequisites for a large modern port. Even here there are still many natural disadvantages to be taken into account and corrected by technical measures. The Bay of Haifa is one-sided, that is land-locked only from the east and south and wide open to the west and north-west. This accounts for the fact that before the building of the breakwaters, ships in unfavourable weather, especially in the winter season, could not approach the port and discharge their cargo by lighter. They had often to anchor far outside for days on end, or to proceed to Beirut which had possessed a harbour protected by breakwaters since 1893.

Haifa Bay as a whole has two natural sites for a port; the southern part of the bay and the smaller north end at Acre, which for centuries was a port of renown. Shoals and reefs hamper the approach to the latter, which is also exposed to the frequent south- and south-west winds. The southern part of the bay, by contrast, has a much smoother sea-floor and is protected against SW and S winds by Mount Carmel. There was no question as to the suitability of this part for the construction of the first big port in the country.

THE PORT

The construction of the port began in 1929 and was completed in 1933. Its main constituent is a breakwater 2210 m. long, 12 m. wide and 4 m. high that begins at Ras el-Kurum, extending to the ESE. A second breakwater on the lee-side, of 765 m. length, extends in a meridional direction. The width of the entrance between these two breakwaters is 183 m. The water-area of the harbour covers 121.4 ha. A triangle-shaped area of 34 ha. the maximum width of which is 350 m. has been filled up with dredged sand at the beginning of the work of construction. On the area thus reclaimed, various sheds and store-buildings, quay-side railway-tracks, road-approaches, loading and unloading facilities and the port-management offices were erected. The length of the quays makes it possible for six ships of 8,000-10,000 tons to be simultaneously moored alongside. It is intended to provide quayside-facilities for six more ships, and consequently to reclaim an additional part of the water-area.

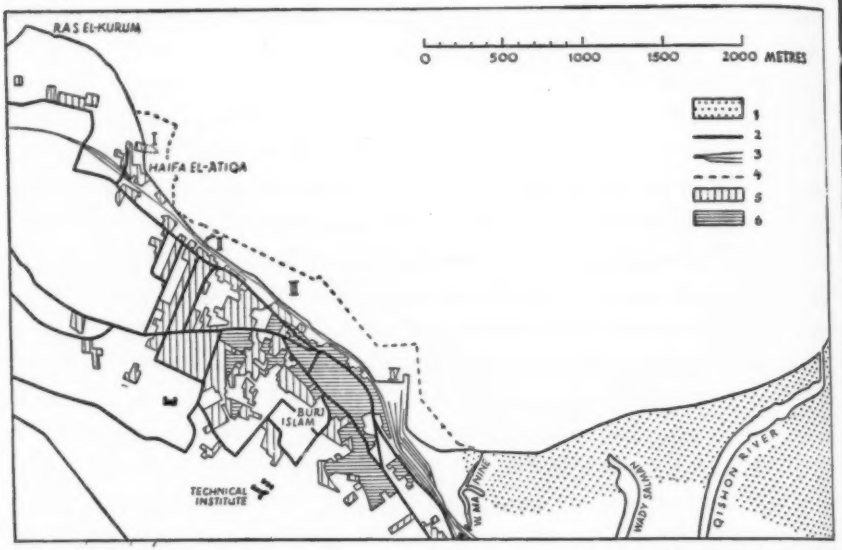

Fig. 2. Haifa, 1919. *(Drawn by N. Z. Bar)*

1 Sand dunes
2 Main roads
3 Railway tracks
4 Border of reclaimed area
5 Sparsely built-up area
6 Densely built-up area

I Roman mole
II German jetty
III Water area reclaimed by the construction of the port (1933)
IV Turkish jetty

Based on a map surveyed by 7th Field Survey Coy., R. E., E. E. F., 1919.

The basin of the harbour has been deepened throughout by dredging. The part adjacent to the entrance between the two breakwaters was dredged to a depth of 10.7 m. and the area to the west of it to 9.4 m. The basin contains two additional small compartments separated by moles from the main basin. The eastern one is the oil-dock—now only occasionally used since the suspension of the flow of oil from Iraq. East of the port there is a small cooling-basin, that serves the nearby electricity plant and will constitute a part of the basin with the enlargement of the port in the near future.[25]

[25] The following data may serve for comparison: The port of Beirut, the only other major port on the East Mediterranean coast (and except for oil—the principal import and export harbour not only of Lebanon but also of Syria) covers a water area of only 44.4 ha. The port of Tripoli covers a water area of 250 ha. but has no quays capable of accomodating bigger vessels. Besides, the port is dangerous for ships berthing when northerly winds, quite frequent in this region, are blowing. The oil-harbour, terminal of a pipeline branch from Iraq, lies about 4 km. north of the port. The port of Latakia consists

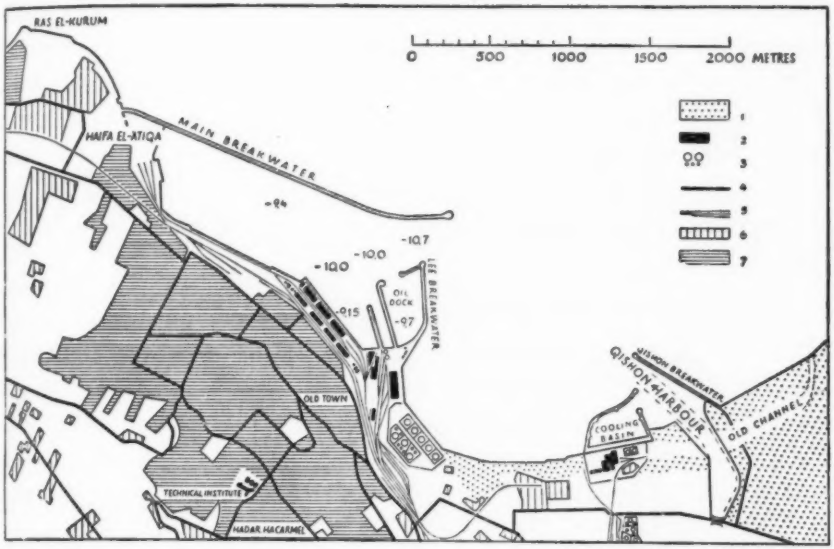

Fig. 3. Haifa and its harbour, 1953. *(Drawn by N. Z. Baer)*

1 Sand dunes
2 Major public buildings and harbour utilities
3 Oil tanks
4 Main roads
5 Railway tracks
6 Sparsely built-up area
7 Densely built-up area

Based on: Haifa, 1:100,000, sheet 1, Survey of Palestine, 1943, and material supplied by the Director, Haifa Port Administration, and by the Qishon Development Department.

At present there is work in progress to create an additional port to the existing main one. This port, the so-called Qishon harbour, will adjoin the cooling-basin immediately to the east. It will consist chiefly of a channel, 2750 m. long, 82 m. wide and 5 m. deep, the future artificial outlet of the Qishon River. The channel follows for some hundreds of metres the artificially straightened course of the Qishon and continues then independently of the river-course. This new outlet of the Qishon will contain sea-water. The Qishon itself will be dammed up immediately east of the Qishon harbour and its waters used for irrigation purposes. Additional berthing-space will be created by basins branching off laterally from

of an open, unprotected roadstead and a small harbour-basin and is suitable for the berthing of small vessels only. Cf. Nathan, Gass & Creamer, p. 260; *The Middle East*, pp. 313-314. In recent years two new important oil-harbours have been added. Saida (Sidon) is the terminal of the Trans-Arabian-Pipeline transporting oil from the Saudi Arabian fields: its annual capacity is about 15 million tons. Banias is the terminal of the new pipeline of the Iraq Petroleum Company with a capacity of about 13 million tons per annum.

the main channel. The entrance into the channel will be protected by a breakwater of 600 m. length extending NW, which afterwards will be prolonged by a link of one thousand metres to join the lee-breakwater of the main port. After dredging to a depth of 9 m. the basin formed by this breakwater and that of the cooling-basin will afford ample room for anchorage of even large ships with repairing facilities by a dry-dock to be installed there in the near future. The Qishon harbour itself together with its branches will be usable only for vessels up to 6000 tons.[26]

THE MARITIME RELATIONS

We owe to Mecking a detailed study of the factors of location as influencing ports. According to him, two area-relationships are of the first importance: (a) the port's relations with nearby coasts and their ports, especially with those of the neighbouring countries, i.e.: the ultimate destination of sea traffic *from* the port and *to* it; (b) the situation of the port in relation to the land area behind.

The Maritime Relations of the Port of Haifa

As far as the relationship with nearby coasts is concerned, Haifa is the southernmost natural harbour of the East Mediterranean coast with essential natural advantages, as will be shown later. The next ports of importance are, in the SW, Port Said and Alexandria, the latter commanding even more natural advantages than Haifa. To the north lie Beirut, Tripoli, Latakia and Iskanderun (Alexandretta), the last named of which is only now being transformed into a modern port. To the NW lie the Cypriote ports of Larnaca and Famagusta, both of them second-class ports. In Israel itself there exists no other deep-water harbour. Both in Jaffa (at present scarcely used) and in Tel Aviv the ships have to anchor in the open sea at some distance from the shore and there load and unload their cargoes.

The ports of call and destination for the seaborne traffic to and from Haifa are in the Mediterranean and its adjacent seas: Smyrna, Istanbul, Constanta, Odessa, Piraeus, the main Italian ports, Trieste and Marseilles. In the Atlantic

[26] Up to now (Sept. 1953) the breakwater of 600 m. length has been finished and so has the dredging of the channel to the depth of 7.5 m. Quays of a length of 345 m. have been constructed and most of the area lying to the west of the channel and north of the pipeline has been properly adapted and built up. (The data concerning the Qishon harbour have been supplied by courtesy of Mr. A. Papper of the Qishon Development Department, Haifa).

and its adjacent seas the ports of Southern England are of importance; for the transoceanic traffic mainly New York.[27]

The Relationship of Haifa with the Inland Areas

It has already been remarked that the main natural advantage of Haifa as compared with other Levant ports rests in its accessibility from a very wide region. There is an easy transition from the Haifa Plain, the immediate hinterland of the port, through a gap along the Qishon Valley between the Carmel and the hills of Lower Galilee into the Jezreel Plain. The divide between the Qishon and the Harod leads almost imperceptibly east into the Vale of Harod and the Beth-Shan Plain: it is located near 'Affule at 62 m. above sea-level. The Jordan Valley to the east is not yet so depressed as it is further to the south and, what counts for more, there are a number of routes which permit a relatively easy ascent to the eastern uplands. The deeply incised Yarmuk Valley, a short distance north of the junction of the Harod Valley with the Jordan continues as it were the west-east corridor created by the Jezreel-Beth-Shan depressions. The winding valley of the Yarmuk leads up to the heart of the plateau-lands of Transjordan, where there are no serious relief obstacles to communication either to north, south or east. It should be emphasized, that this succession of broad west-east valleys in Western Palestine provides an easy access from Haifa to a very wide inland area. This natural passage is the more important as Haifa is the first natural harbour north of the Nile Delta, a stretch of 500 km.

Such a broad and convenient passage occurs only once again on the whole East Mediterranean coast, viz. along the depression of Nahr Kebir (often called the Tripoli-Homs gap). Other gaps further north, leading to Latakia are far less convenient, owing to their considerable elevation and comparative remoteness from important economic regions (the Beq'a and Damascus). The importance

[27] The following data for 1951 (courtesy of the Director of the Haifa Port) show the most important ports of origin and destination for Haifa shipping:

Port of origin	*Number of ships*	*Tonnage*	*Percentage of total tonnage**	*Port of destination*	*Number of ships*	*Tonnage*	*Percentage of total tonnage**
New York	59	330,856	15.7	New York	41	245,168	11.6
Marseilles	69	211,571	10.1	Marseilles	88	232,572	11.1
Constanta	51	167,575	7.9	Constanta	53	170,608	8.1
Trieste	67	107,242	5.1	Istanbul	81	110,386	5.2
Genoa	92	96,710	4.6	Trieste	29	66,478	3.2
London	47	60,441	2.9	Venice	28	52,969	2.5

* The total tonnage handled at Haifa in 1951 was 2,107,565, excluding oil tankers.

for communication of such broad tectonic valleys leading at ease into the hinterland cannot be over-emphasized. In the south-western borderlands of Asia with their mountain ranges running near and parallel to the coast and locking them off from the inland, they assume *mutatis mutandis* the same function concerning communication as the waterways and estuaries of the Atlantic coast.

HAIFA AND ITS FACILITIES FOR COMMUNICATION WITH THE HINTERLAND

Thanks to the configuration of its surroundings Haifa forms the natural centre of a network of roads and railways radiating in three directions: south, east and north and connecting Palestine with other countries. There are only two natural 'bottle-necks': one is the narrow gap of the Qishon Valley leading eastwards into the Jezreel Plain; the second the narrow coastal strip south of Cape Carmel. Here the main coastal road and the railway are confined to a strip narrowing down to 200 m. at the foot of the steep western cliff of Mount Carmel. The road through the Jezreel Plain[28] meets the ancient highway Jenin-Nablus-Jerusalem-Hebron-Beersheba and leads northwards through Tiberias and Quneitra to Damascus. This road crosses the Jordan 50 m. above sea-level at the Bridge of the Daughters of Jacob. The railway runs some distance to the south descending to 240 m. below sea-level. It then ascends through the Yarmuk Valley to the eastern plateau-lands. Only the road running along the coast to the north encounters a major obstacle within Palestine: the steep cape of Rosh ha-Niqrah.

To the south the steadily widening coastal plain of Palestine offers an easy passage into that of northernmost Sinai as far as the Suez Canal and both road and railway from Haifa traverse these plains at convenient distance one from another.

The present political situation makes it difficult to describe the true economic potentialities and possibilities of Haifa's port and one has therefore to look back to the situation and the trends in the period of Mandatory Palestine. During that period a sort of wider economic sphere began to take shape for Haifa, extending far beyond the borders of Palestine and promising great developments for the future. Haifa was the terminal of a pipeline from the oilfields of Kirkuk in Iraq with an annual capacity of 2,000,000 tons. Furthermore, the refinery, erected in the Haifa Bay during World War II, exported a considerable volume of finished

[28] A narrow-gauge railway—now disused—traverses the Jezreel and Harod Valleys from west to east.

oil-products. More and more goods from adjacent countries, especially from Transjordan and South Syria were shipped abroad from Haifa, while as far as imports were concerned[29] Haifa was actually Transjordan's only harbour. Political conditions since 1948 have cut short this development and Haifa's great potentialities as an outlet for the neighbouring countries remain latent until these conditions change.

HAIFA-ACRE

With all the advantages of Haifa, it is natural to ask why it played no part in the past history of Palestine. The problem of harbour-sites was then just as important as it is today and even necessitated the construction of ports at certain places not favoured by nature at all such as Gaza or Caesarea.[30] Why did the seafaring Phoenicians and their successors who ruled this part of the coast make no use of the southernmost part of the Haifa Bay, choosing instead sites which necessitated artificial constructions as in the case of Caesarea? Why did Acre and not Haifa become the leading harbour of Northern Palestine from the earliest times until recently? One explanation, advanced frequently, is that the ancient ports, originally quite adequate, silted up in the course of centuries. This may be correct to a point, though the extent of silting-up is often exaggerated, but it still does not answer our question, nor does the explanation that the growing size of ships rendered most of the ancient ports unserviceable.

The most plausible explanation seems to be that in ancient times, especially in the Phoenician era, the relation of a port to the land-interior was of far less importance than it is today,[31] when demands have changed radically. A site naturally protected by sea, elevation and other topographical features was the chief desideratum then and in this respect Acre (Ptolemais of the Graeco-Roman period) had noticeable advantages over sites in the southern part of the bay.

An almost universal characteristic of Phoenician ports and hence of many Graeco-Roman harbours on this coast is their situation on tips of promontories or on islets situated just off the coast (e.g. Tyre, Arados) rather than on the inner curves of the embayments. These promontories provided a highly valued measure of protection in addition to the mountain-barrier to the east and the spurs coming

[29] Imports by far exceeded exports both in Palestine and Transjordan.

[30] The inhospitality of the Palestinian coast is already stressed by Josephus Flavius, when describing the great difficulties that had to be surmounted when Herod built the port of Caesarea. *BJ* I, 409-410. Cf. Reifenberg, p. 20 ff.

[31] 'The location of the Phoenician harbour-towns was determined by purely coastal factors, not by consideration of land routes tapping the interior.' Woolley, p. 180.

down to the sea and locking off the area of one harbour-city from that of its neighbour. Port-sites with favourable landward communications were disregarded by the Phoenicians, if they failed to meet these security requirements. The volume of goods to be transported into the interior by pack-animals was so small as to be of less influence than the security requirements. Moreover, at a time when ships were small, the promontory-site had some harbouring advantages too. Vessels had here a choice of two alternative lee-sides for mooring and hence could find shelter both from sea- and land-winds. Many Phoenician ports were double, or compensating ports; they often had two harbours, an inner and outer one. They thus had no need to build large and elaborate breakwaters; small jetties were for the most part the main prerequisite of a promontory-port.

From the point of view of natural defended position the southernmost part of the Haifa-Bay had obvious disadvantages, situated at the edge of a relatively wide open plain freely accessible from east, north and south with the high Carmel dominating immediately behind. The landspit-like projection of Acre by contrast required only protection by short walls on the north and east side, the most dangerous sides.[32] The land projection into the sea offered sufficient protection for landing craft from the west, north-west and east winds, as they could choose the leeward side in each case.

A small town did none the less exist on the site of present Haifa in late Phoenician times. It lay between what is now the German Colony and Bat Galim quarter, i.e. at the west corner of the present harbour; the site is now called 'Ancient Haifa'. W of it at a distance of 3 km. lay Sykaminon on a short blunt land-projection from which the coastline on both sides gently recedes. The site of Sykaminon had more of the prerequisites of an ancient port than the site of ancient Haifa. The small Tell es-Samak rising to a height of 14.5 m. marks its site. Neither Sykaminon nor Haifa had any importance compared with Acre; especially Haifa is known to have been a place existing mainly on fishing and processing of purple snails. Nor did they even enjoy the advantages of land-bound traffic, for they lay off the main route leading from Mesopotamia and Syria to Egypt through the coastal plain of Palestine. This route traversed the Carmel further to the SE through the 'Iron and Yoqne'am valleys respectively.

[32] Ibrahim Pasha who took Acre for Mohammed Ali of Egypt (1832) began with the construction of a fosse, that would separate completely the little promontory from the mainland and turn it into a sort of island, thus greatly increasing its defensive strength. This undertaking was not finished for various reasons, mainly political. Cf. Thomson, p. 310.

There are no records of Sykaminon after the Byzantine period.[33] Ancient Haifa continued to exist as a very unimportant place until the middle of the 18th century. It appears in records and old geographical descriptions and maps of the Holy Land as Caiphas, Cayphas, Caiffa and so on. About the year 1761 it was destroyed by Dhahr el-'Amr, a powerful sheikh who set up a semi-independent state of his own in Galilee and Acre. He built in 1785 a town not far from the one he had destroyed and this inherited the name of Haifa. New Haifa in the beginning was greatly overshadowed by Acre, whose fortunes were once again in the ascendant after many vicissitudes; it was now the most important port of North Palestine. However, the prominence of Acre made it a major strategic object in wars and feuds and resulted in repeated material and economic damage to the town.[34] On the other side the importance of Acre as a sea-fortress and garrison-town implied many Turkish prohibitions and restrictions upon settlement, trade and traffic there.[35] For instance it was forbidden to build houses within a radius of 3 km. from its walls. For all these reasons Haifa very soon began to compete with Acre and before long outstripped it as a port. Furthermore with the coming of the steamship there developed the need for greater harbour-space and adequate deep-water conditions. In addition, the attraction of the Carmel for a growing number of European residents in the second half of the nineteenth century should not be overlooked. The Carmel is the only mountain in Palestine bordering directly the sea, and the resulting climate and relatively rich vegetation including woods had a strong appeal.

The growing preponderance of Haifa over Acre is reflected in the fact that the former rather than its ancient and famous neighbour was chosen to be the head of a feeder-line of the Hejaz Railway in 1905.[36] This led to the wheat from Hauran being exported through Haifa instead of Acre as hitherto. This export involved a considerable volume as compared with the conditions of Levant trade in those days, viz. 4000-5000 camel-loads (ca. 1000 tons) per day during the two months after the harvest.[37]

Harbour-construction began on a small scale in 1908 (until then there existed only a little mole of 420 m. length).[38] This sealed the final transference of har-

[33] For a comprehensive history of Haifa, cf. Vilnai.

[34] Acre suffered great damage during the siege of Napoleon (1799) and when recaptured by the Turks from Ibrahim Pasha with British and Austrian help (1840). [35] Thomson, p. 310.

[36] The main purpose of this feeder-line was to transport pilgrims from North Africa to the holy places around Mecca. [37] Fischer, p. 91. [38] A little jetty was constructed by the German colony of Haifa on the occasion of a visit of the Emperor Wilhelm II to this town.

bourage from Acre to Haifa as far as larger seagoing vessels were concerned. At the same time it meant the beginning of competition with the neighbouring harbours of Jaffa and Beirut. A decisive step in Haifa's development was the building of a modern port in 1933 and the completion in 1934 of the 1500 km. long branch of the pipeline from the oil-fields of Iraq which turned Haifa into the most important oil-port of the whole Mediterranean area.

The new port of Haifa was from the outset a serious competitor to Beirut.[39] Already in 1908 Haifa was berthing more than 600 steamers and about 700 sailing vessels. She subsequently began to outstrip her northern neighbour and approach the annual tonnage handled by the port of Alexandria. Whereas in 1913 the tonnage of ships arriving at Haifa was about 800,000, that of Beirut 1,700,000 and that of Alexandria 3,780,000 (i.e. with Haifa's tonnage as a unit, the proportion was 1 : 2 : 4.7) the data for 1935 show a complete change. Haifa with a tonnage of arriving ships amounting to about 5,000,000 surpassed Beirut (2,700,000) and drew near to Alexandria (6,100,000). Again using Haifa's 1913-tonnage as unit we find that the proportion in 1935 was 6.25 : 3.4 : 7.6.

As for Jaffa, Haifa was from the start her most dangerous competitor. Whereas the tonnage of ships loading and unloading at Jaffa was about the same from 1920 to 1930 (about 900,000 p.a.), after the construction of the new port in 1936 the tonnage of ships anchoring at Haifa rose to about 5,000,000 as against 1,000,000 at Jaffa.[40]

At present, owing to the peculiar political conditions, Haifa serves only the State of Israel, handling most of its import and export. It furthermore is almost the sole maritime gateway for the tremendous immigration which has doubled the population of Israel in the five years 1948-1953.[41]

[39] de Monicault, p. 110.

[40] Data derived from various official statistical publications listed in the Bibliography. Cf. Wydra, p. 195.

[41] The number of vessels that arrived in Haifa in the period 1.6.1951-1.6.1952 amounted to 1135, as against 1222 for the same period in the preceding year. The number of passengers which arrived in this period at Haifa amounted to 80,855 (1950-51: 125,956). About 80 per cent of them were immigrants. The cargo unloaded in Haifa port in the same period was 1,301,583 tons whilst 193,132 tons were loaded. This reduction in cargo handled as compared with the years previous to the establishment of the State of Israel is mainly due to the stoppage of oil shipments from Haifa.—

The author is indebted to his friend N. Rosenan for valuable suggestions and constructive criticism of this paper.

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THE NINTH ANNUAL CONVENTION OF THE ISRAEL EXPLORATION SOCIETY

BEERSHEBA 25-29 SEPTEMBER 1953

SUMMARY OF PAPERS

THE Annual Conventions of the Israel Exploration Society have been held during the Feast of Tabernacles since 1943. The Convention, which is open to members of the Society and the general public, consists normally of a series of lectures and excursions, visits to museums, specially arranged exhibitions etc. The Conventions have been held at various places in the country and they have always had a central theme appropriate to their venue.

It was decided early in 1953 to hold the Ninth Convention in the Negev, and to invite Prof. W. F. Albright to be the guest of honour. Owing to the cooperation of the Beersheba Municipality and other authorities of the area, the arrangements of the Convention worked well. As usual, there was a very large attendance, which included members of the agricultural settlements around Beersheba and new settlers in the town and its recently-built suburbs.

The First Session was opened on 25 September 1953 in the new Municipal Theatre by H.E. the President of Israel, Mr. I. BEN-ZVI.

The President recalled that twenty-five years ago the Negev was from a scientific point of view terra incognita, despite the efforts of Lawrence and Woolley, Jarvis and the first excavator of the Northern Negev, Sir Flinders Petrie. The opening up of this area was due to the pioneer colonists who settled there in the Mandatory period, in spite of all the obstacles placed in their way by men and nature. He mentioned especially the simultaneous erection of eleven settlements seven years ago, in October 1946. These efforts were not in vain: as a result the Negev was included in the proposed Jewish State under the UNO partition plan, although many valiant lives were to be sacrificed before this plan could become a reality. Since the establishment of the State of Israel, 61 new settlements have been founded in the Negev. Great efforts have been made to study its ancient installations, the remains of its agriculture from the Chalcolithic, Israelite, Nabataean and Byzantine times, its mines dating from the time of Solomon onwards, its cities, from Biblical Sharuhen to Nabataean and Byzantine Elusa, Mampsis and Eboda. Owing to these efforts the Government Names Commission had been able to restore to a great extent the ancient Hebrew nomenclature of this area. The President concluded with greetings to the Municipality of Beersheba and its Mayor, Mr. Tuviyahu, to the Society and to Prof. W. F. Albright, and declared the Convention open.

The formal opening was followed by the first lecture, delivered by the President of the Hebrew University, Prof. B. MAZAR on *The Negev in Ancient Times.*

The lecturer began by observing that the line of Bronze Age settlements fol-

lows the valleys in the Northern Negev, with the principal settlements at Tell Jemmeh, Tell el-Fari'a, Tell Saba and Tell el-Milh. These mark the extreme line of Bronze Age cities, south of which are only nomad encampments, a line corresponding to the much later Limes Palestinae. It should be borne in mind, however, that in the Early and Middle Bronze Ages the copper mines of the Negev were exploited and that there was a connection between Southern Palestine and the Sinai mines, as is evident from inscriptions etc. The limits of Bronze Age settlement are also evident from the traditions connected with the conquest of Canaan, according to which 'Arad was the principal city, and the extreme border of settlement was at Horma, probably to be identified with Tell el-Milh. The importance of 'Arad in the Bronze and Iron Ages has become more and more apparent from the remains at the site. As regards the problem of Gerar, this is being dealt with by Mr. Y. Aharoni (see infra, p. 54). The Israelite period saw the beginning of a southward expansion, which reached its peak in the period of the Israelite Monarchy. This we learn on the one hand from the archaeological surveys carried out in that region by the late P. L. O. Guy and others, and on the other hand from the inscriptions of Shishak. The latter give us a clear, if incomplete, picture of the state of the settlement in the period of the Early Monarchy (especially the times of Solomon and those immediately afterwards). A study of this text and of the place-names mentioned there enables us to classify the Negev sites into three groups: (a) a line of Israelite royal forts, called *ḥagarim*, i. e. fortresses; (b) various other isolated localities, some of which can be identified with places mentioned in the Bible or with present-day place names; (c) areas for grazing used by various families and tribes. The names of many of these have been preserved in the genealogical lists of 1 Chronicles ii-iv. The expansion of Israelite settlement was to a large extent due to the use of plastered (i. e. watertight) cisterns, a technique first employed at this time. The importance of the copper mines in the 'Arava for the economy of the Israelite period is becoming clearer and clearer as research progresses. In conclusion the lecturer surveyed the state of settlement in the Negev at the end of the period of the Israelite Monarchy, especially in the time of King Uzziah when settlement extended over almost the whole area of the Negev. The economic basis of existence in that period was, apart from agriculture, the importance of the Negev as a transit-area between the Red Sea and Arabia in the south and east, and the sea coast and Egypt in the north and west.

The Second Session of the Convention was held the same evening. Prof. M. SCHWABE lectured on *Jewish Peasants in the Negev in the Talmudic Period*.

The evidence for their existence is to be found in the speeches and letters of Libanius, a rhetor of Antioch who flourished in the fourth century A. D. Libanius succeeded his teacher Zenobius in the chair of rhetorics at Antioch. Zenobius who was born at Elusa in the Negev, had once been Professor in his native city. It appears that the teachers in Elusa were paid

from the produce of the surrounding country-side, which is interesting evidence for the fertility of the Northern Negev at that period. It appears also that Libanius inherited from his predecessor certain estates (probably near Elusa) which were attached to the chair of rhetorics at Antioch. As owner of the estate Libanius was responsible for the collection of taxes from his farmers. In the anarchic conditions of the period, however, the farmers obtained the protection of the military commander in the area and refused to pay. The courts were intimidated by the military and gave judgment for the defaulters. Libanius in his speech before the emperor Theodosius I in 390 asked for redress, incidentally mentioning the fact that some of the obstreperous farmers, who, however, admittedly excelled in their profession, were Jews. They had been farmers on the estate for four generations, i.e. since 260/270 or thereabouts. We thus obtain a valuable side-light on the continuation of Jewish agriculture in this area as late as the fourth century A.D.

Mr. S. YEIVIN, Director of Antiquities, lectured on *Beersheba, City of the Patriarchs*.

The lecturer examined the period from three points of view: (1) the personal and place names; (2) the territorial boundaries of the period, the ways of the Patriarchs and the ancient lines of communication; (3) the customs and way of living of the Patriarchs.

The nomenclature of the patriarchal times is restricted to that period and corresponds to the general Western Semitic onomasticon in the first third of the second millenium B.C. The ways used by the Patriarchs and the state of the areas they traversed correspond to those existing till the end of the 18th or the beginning of the 17th century B.C. The legal customs observed by the Patriarchs can be explained only on the basis of those in force in Southern and Northern Mesopotamia in the first half of the second millenium B.C.; even the basis for the monotheistic faith of Abraham can be paralleled in Southern Mesopotamia just at the beginning of the same period. The two quasi-historical references found in the Bible, viz. the date of the foundation of Hebron and the events told in Genesis xiv, fit well with what is known of the 18th century B.C., but with no other period in the history of the Ancient East. The principal background to which the Patriarchal history is related is the Gerar area. At that period there were in this area only a few settlements, which dominated the countryside. Large areas were devoted to occasional agriculture and grazing, which were enough for seminomads of the type of the House of Abraham. Accordingly we find that the Patriarchs, having left Ur when it was destroyed in the 20th century, and Harran in the 18th under Hyksos pressure, moved southwards to the fringe areas of the highlands of Western Palestine and the Northern Negev. With the establishment of Hyksos rule in Canaan, they were again forced in years of drought to move onwards into Egypt, which they entered by special permission of the Pharaohs of the 16th dynasty in the middle (?) of the 17th century B.C.

On September 26th the members of the Convention visited the Beersheba

Municipal Museum, and the excavations of Messrs. J. Perrot and M. Dothan at two places in the vicinity of Beersheba; the excavators conducted the visits and gave explanations on the spot.

The Third Session of the Convention opened with a lecture by Mrs. Ruth AMIRAN on *The Cities of the Negev*, a summary of excavation results.

After tracing the story of the exploration of the Negev from the first searchers for the route of Exodus to the military and archaeological cartography of Woolley and Lawrence and the Colt expedition of 1933-38, the lecturer passed in review several of the problems connected with the six dead cities in this area. How did they originate? After discussing various suggestions, Mrs. Amiran considered it most likely that they began with the caravan trade of the Nabataeans across the Negev, the agricultural development being secondary and growing round the nucleus of the cities. When did they originate? There is a Hellenistic cemetery at Elusa, Rhodian jar-handles at Nitsanah, and black-glazed Hellenistic pottery has been found at Mamshit (Kurnub) together with Nabataean ware. The examination of the city dumps at Elusa and elsewhere leads however to the conclusion that the earliest Nabataean settlements in the Negev belong to the time of Obodas II, who founded Eboda and was a contemporary of King Herod. The Nabataean cities developed slowly and naturally; there is no evidence of Graeco-Roman town planning. The absence of town walls reflects the peaceful nature of their origin; forts existed only in the outlying towns of Nitsanah, Eboda and Mampsis and there only as places of refuge for the population in the event of a raid. There is evidence that these cities declined in the second-third centuries A.D. as a result of a change of trade routes; but there was a revival in the fourth century. The Byzantine period saw the greatest development of the cities and agriculture of the Negev, the water conservation works being especially remarkable. These are not as yet completely surveyed and explored and even their attribution (Nabataean or Byzantine?) is in doubt. The main find of the excavations was the 150 papyri found at Nitsanah; they are mostly Greek, but some are Arabic and Syriac and even Latin.

The next lecturer was Dr. W.C. LOWDERMILK who spoke on *The Use of Flood-Waters by the Nabataeans and Byzantines.*

After explaining that contrary to the opinion of some scholars, there is no evidence of a change of climate in the Negev since ancient times, and that the inhabitants of the Negev in the past were faced by the same problems as those of the present, viz. heat, excessive evaporation and lack of rain, the lecturer proceeded to describe how these difficulties were dealt with in the past. Open reservoirs soon went dry owing to evaporation, and underground cisterns were preferred. In the cities every house had one or more cisterns, some of them being of considerable size. The people of Eboda built dams across the wadis, which directed the water into underground cisterns cut in the wadi walls. As there were on the average 3 to 7 floods in each wadi in the course of a year, such floods sufficed to fill the cisterns. Another method frequent-

ly employed in the past was to use the ground itself as a reservoir. In the valleys there were fertile strips of loess washed down from the hills. By directing the flood waters on to these strips, the rain water was supplemented and a water reserve was achieved which sufficed to ensure some crops under semi-humid conditions; this was the principal method of irrigation in the valleys of the Negev in the past.

Dr. A. BIRAN next gave an account of *The Work of the Government Names Commission in the Negev*, which so far has restored or innovated Hebrew names for all the mountains, rivers, places and ruins appearing on the 1: 250,000 map of the Negev; it is at present adding to this as necessity arises. The new names are coming more and more into general use.

The Fourth Session of the Convention was opened the same afternoon. The first lecturer was Dr. D.H.K. AMIRAN, on *The Geography of the Negev and the Southern Limit of Settlement in Israel.*

After describing the four principal geographical areas of the Negev, viz. the Beersheba Basin with its rich loess lands, the Negev highlands with their mountain chains and *makhteshim* (erosion craters), the Middle Negev with its wide plateaus and the wild and many-coloured Elath mountains, the lecturer pointed out that the climate of the Negev is peculiar in having an annual rainfall of less than 300 mm., and in the south even less than 50 mm. In addition, the annual variations are very large. In consequence, there are wide differences in settlement between the part of the country with Mediterranean climate and the Central and Southern Negev. The Beersheba Basin in the Northern Negev is a transition zone in which the boundary of settlement advances and recedes according to the colonizing capacities of the settlers. Today the area of settlement is being extended over the whole loess area with the help of irrigation projects on a national scale. The fertility of the loess may create in the Beersheba area one of the major agricultural zones of Israel; whereas settlement beyond the loess areas does not appear feasible at present.

Dr. J.W. HIRSCHBERG continued with a lecture on *The Negev in the Arab Period.*

The striking development of the Negev at the end of antiquity and the beginning of the Middle Ages was due to the fact that (a) the Negev was crossed by a main trading route between India, the islands of the Indian Ocean, Arabia and Abyssinia on the one hand and Europe on the other. In time of war between the Roman or Byzantine empires and the Persians this was the only trade route open to caravans. (b) With the destruction of the Second Temple many Jews fled to this area, looking for shelter in the cities and oases which were developing in the Negev and Southern Trans-Jordan. (c) The natural increase of population and its density in Palestine may have induced many to look for new living space. In consequence we find in the first centuries A.D. a series of Jewish settlements—agricultural and mercantile—in the Negev (in the wider sense of the word); religious centres also sprang up at Gaza and Zoar. The population in these areas was hostile to the Byzantines and favoured the Arabs, when they came

from the Hejaz to conquer Southern Palestine and the whole of the country. This explanation of the Arab conquest becomes clearer if we consider the composition of the population of the Negev. In spite of all the Hellenization—evidence a series of inscriptions—, we feel the Jews' sympathy for the Arabs and hatred of the Byzantines. However, with the Arab conquest and the revival of the great trade route through Iraq and Northern Syria, the Negev lost its principal source of income. At the same time the Arab conquest of North Africa and Spain opened new prospects to those desirous of improving their lot, so that we may assume that many people left the Negev. Nevertheless, settlement continued, and the complete ruin of this area was achieved only in the Crusader period, when all connections between the Negev, the coast and Arabia were finally cut.

The last lecturer in this session was Mr. J. BRASLAWSKY, who spoke on *The Nomads of the Negev*.

In the Mandatory period the Beduin character of the Negev was most prominent and the Mandatory government took care to keep it so by excluding from the Beersheba Sub-District every settled village. With the War of Independence the number of Beduin in the Negev decreased considerably and their influence is now much less felt.

Research concerning the Beduin in the Negev has so far led to two clear conclusions: (a) There are evident contradictions in their confused traditions as to their origin, descent and the history of their occupation of the Negev; (b) their alleged purity of race is nothing but a myth. The mixture of races is no smaller in the case of the Beduin than in that of the villagers. The tribes and families of the Negev Beduin are a conglomeration of families and fragments of tribes from North Africa to the Persian Gulf. Some of the Negev tribes are called 'Franks' (Franji), 'People of the Cross' etc., and observe customs which are a pale reflection of Christian manners. The Serahin tribe traces its ancestry to Simeon, and the small tribe of Bani Uqba to Jethro, the father-in-law of Moses. This tribe served until recently as honoured and respected judges, who were greeted with the words: 'Peace upon the People of Jethro and the Relatives of Moses'.—Many customs of the Negev Beduin serve to throw light on Biblical nomads and their life, as for example the division of the area between various tribes and peoples, the semi-nomadic type of the Biblical Negevite, the transition from nomad life to settlement, the fight for water, the granaries dug underground, the invasion of the settled areas by the Beduin in years of drought, the collection of 'protection' taxes from the villagers, etc.

The Fifth Session opened the same evening. The first speaker was the Prime Minister, Mr. D. BEN-GURION.

Mr. Ben-Gurion stressed the importance of Biblical studies for the present generation, the first generation of deliverance. The selection of Beersheba for the Convention is particularly meritorious, for it is the only city within the boundaries of the State which is connected with memories of the Patriarchs. Mr. Ben-Gurion mentioned the achievements of

the Defence Army of Israel in liberating the Negev and added that most of the inhabitants of Beersheba count the past of the city only from the moment they settled there, though the reality is quite different. He stressed the importance of Abraham, the first Biblical inhabitant of Beersheba, in world history, and expressed the idea that the Bible, the greatest creation of the Jewish people, was possible only in a period of independence. He drew attention to the importance of the basic element of Judaism enunciated by Abraham, that of *Ḥessed* (grace) as complementary to and higher than *Zedek* (justice). He concluded by wishing the Convention success in its efforts to establish a link between the past and the present.

The Prime Minister was followed by the guest of honour, Prof. W. F. ALBRIGHT who spoke on *Mount Sinai and the Exodus.*

Prof. Albright dealt in his lecture with three main points: (a) The excavations at Merkhah on the western shore of the Sinai Peninsula on the Gulf of Suez, have shown that contrary to the opinion of many scholars, the level of the Red Sea at the time of the Exodus was not higher than at present. These findings correspond to the discoveries at Tell el-Kheleife of Prof. Nelson Glueck, who has found that in the Gulf of Elath also sea-level has not changed appreciably since antiquity. The potsherds and remains of settlement at this point have revealed the existence of an Egyptian station from the time of the 18th dynasty (15th cent. B. C.). The figures found at Serabit el-Khadem, a little way inland from Merkhah are of Egyptianizing character and are apparently the work of North-western Semites (Hebrews?) who worked in the turquoise mines of Sinai. (b) From this it follows, according to Prof. Albright, that the route of the Exodus was much further north than is often assumed; this follows also from Exodus xiv, where Baal Zaphon is mentioned. Baal Zaphon is a god of the sea, of ships and of sailors; his sanctuary apparently corresponds to classical Daphne west of the Suez Canal. The Israelites had then to turn southwards, in order to avoid the Egyptian garrisons. (c) The third point made by Prof. Albright was that Mount Sinai is a collective name and not the appellation of one peak. The name Sinai corresponds to such appellations as Mount Ephraim, Mount Seir, Mount Lebanon etc. Possibly one of the summits was called Horeb. Mount Sinai was from olden times consecrated to the worship of the gods. Axes and other flint objects were found there from the Chalcolithic and the Early Bronze periods, viz. the 4th and 3rd millenia B. C., and very early rock-cut inscriptions were dedicated to the goddess of the sanctuary at Serabit el-Khadem, where the turquoise mines were located. Mount Sinai was already a sacred mountain in the times of the Patriarchs and it remained sacred down to the period of Moses and Elias. The Nabataean Arabs also carved religious invocations there, and this veneration continued among the Early Christians.

On September 27th the members of the Convention visited the ancient site of Subeita. After an introductory explanation by Dr. N. Avigad, the party visited the site under the guidance of Mrs. Ruth Amiran, Dr. N. Avigad, Mr. Y. Aharoni and Mr. J. Braslawsky.

The Sixth Session of the Convention was divided into two sections. The session of the Archaeological and Historical Section opened with a lecture by Dr. M. STEKELIS on *Prehistoric Settlement in Sinai and the Negev*.

The lecturer reviewed the results of prehistoric research in the Negev and the Sinai since the days of Palmer and Doughty: the explorations of Petrie, Neuville, Breuil and the recent excavations of Perrot and Dothan. He recalled also the survey undertaken by the late Dr. P. Solomonica and himself in 1941 when they explored the area between Nitsanah and Ramon on camel-back and on foot for four weeks. The results of these researches have been the identification of prehistoric cultures of a very varied character. In the Lower Palaeolithic, flints have been found of Abbevillian, Acheulian and Levalloiso-Mousterian type; they are followed by Upper Palaeolithic, Mesolithic and Neolithic cultures. It should be noted that there is evidence of a gap between the cultures of the Negev and those of Egypt till Mesolithic times. The latest researches have concentrated on the proto-historic periods: Chalcolithic and Early Bronze, but there is still some difficulty in distinguishing between these periods, and even more so in establishing their stratification. There seems to have been a change of climate since Neolithic-Chalcolithic times: only thus can one explain even the seasonal presence of shepherds and primitive farmers in the Negev at that time. The paper concluded with a review of the megalithic tombs in the area and their classification.

The next lecturer was M. JEAN PERROT who spoke on *The Chalcolithic Culture of Beersheba*.

The excavations of the Centre national français de la récherche scientifique and the Department of Antiquities have revealed a new culture. Its architecture is represented by huts and big circular houses of stone and dried brick of a new type in Palestine; another kind of rectangular houses might be slightly later in date. The plentiful pottery is decorated with red paint in original geometric patterns. The flint industry is declining, but copper is much in evidence. The people were agriculturists, who stored their grains in silos dug below their houses. Their domestic animals included oxen, goats and sheep. The technological evolution and economic and social organization place their culture midway between the end of the Palaeolithic in Palestine and the beginnings of Civilization, i. e. ca. 5000 years ago.

Mr. Y. AHARONI continued the lectures with a paper on *The Land of Gerar*.

The problem of the identification of Biblical Gerar has to be reconsidered in the light of a new discovery by Mr. D. Allon of Mishmar ha-Negev. According to the Bible, Gerar was a Canaanite royal city on the borders of the Negev; it possessed lands for grazing and for seasonal agriculture. Gerar was an important settlement from the Age of the Patriarchs till the period of the Israelite Monarchy. It was situated in Philistine country, outside the tribal areas, but in the vicinity of Beersheba. It stood west of the Gerar Valley, which marked the boundary of Simeonites in the time of Hezekiah. Wadi Sheri'a is most likely to be the ancient Brook of Gerar. The Land of Gerar was apparently an autonomous region situated between the Philistines

and the Israelites; in the Roman-Byzantine period it became an imperial estate called the Saltus Gerariticus, Gerarike in the Talmud. Its centre was at Orda, which has been identified with Kh. Irq near Tell Abu Hureira. Eusebius fixed the position of Gerar at 25 miles south of Beth Guvrin, which corresponds exactly to the position of Tell Abu Hureira; the Madeba map too shows Gerar west of Beersheba.

Tell Abu Hureira is the only artificial mound which fits these data. It extends over 150 dunams; surface pottery ranges from the Canaanite and Israelite periods; the quantity of the Middle Bronze sherds is especially remarkable. Definite conclusions should, however, await a detailed survey of the area.

Mr. M. DOTHAN reviewed *Sir Flinders Petrie's Excavations in the Northern Negev*. He surveyed Sir Flinders Petrie's work at Tell Jemme and Tell el-Fari'a, its results, the problems it has raised and the revision of Petrie's views on the identification and chronology of these sites in the light of later developments in Palestinian archaeology.

The lecturer rejected some of the conclusions of Petrie at Tell el-Fari'a, both as regards absolute and relative chronology. On the basis of some of the pottery, Petrie connected the early finds from the Wadi Ghazzah sites with what he considered to be similar finds belonging to the Amratian and Badarian cultures; his conclusion was disproved by a closer examination of the finds. The beginnings of settlement at Fari'a have to be placed not earlier than the end of the 17th century B. C. One of the more important problems is that of the date of the second phase of the 'residence'; it appears to belong to the period of Philistine domination, not later than the first quarter of the 12th century B. C. The buildings dated to the 22nd dynasty (the 'Shishak' buildings) seem to belong to the period of Solomon. The identification of Tell Fari'a with Beth Pelet is impossible and the identification proposed by Albright with Sharuhen has been generally accepted.

The last lecture in this Section was delivered by Mr. S. ABRAMSKI on *The Ancient Mines in Sinai and the Negev*.

The problem of the beginnings of the Bronze Age in general must await excavations in Baluchistan, Armenia and the Altai mountains. As regards its beginnings in Egypt, however, we can see three clearly defined points: (a) its beginnings are in the Sinai region; (b) before copper began to be used as metal ore, malachite and azurite ores were exported and used for ornament; (c) the evidence for copper mines is parallel to that for turquoise mines, viz. ore, kilns and slags. The absence of many references to copper in Egyptian inscriptions is unimportant, but the evidence of the slag heaps at Phunon (45-50 thousand tons) compared with those of Cyprus (Mavrovouni and Skouriotissa, two million tons each) shows that the 'Arava mines were only of local or regional importance. They probably were worked also for the Arabian and African markets. In Sinai the fullest exploitation coincides with the period of strong imperialist rule, from Thotmes III to Ramses III (1490-1164 B. C.). This agrees with Albright's work on Sinai harbours and Proto-Sinaitic inscriptions, which shows the main period of activity

to be the 15th-14th centuries. Another problem is that of Asiatics working in the Sinai mines; at a later period they served apparently as instructors and foremen, while the main labour was supplied by convicts. The transition in the Sinai mines from tribal rule to exploitation by a strongly organized central government is very marked; the latter occurs in the 'Arava in the days of the Kenite wanderings and the Exodus and continues in the days of the United Monarchy and the Kingdoms of Judah and Edom (e. g. at Ezion Gaber) until the fifth century B. C.

The Natural Science Section held its meeting concurrently. The first lecturer in this section was Dr. J. VROMAN, who spoke on *The History of Geological Research in the Negev.*

The interest of the earliest explorers was concentrated on the Dead Sea and its vicinity and only incidentally on the Negev. With the arrival of systematic geological exploration the Negev was neglected because of the difficulty of access in Turkish times. In the Mandatory era pioneer work was done by Blake, Shaw and Solomonica, culminating in the geological map 1:250,000. The State of Israel has given fresh impetus to a thoroughgoing geological survey.

For the whole of the Negev a geological survey on the scale of 1:100,000 has been carried out: the resulting map was displayed by the lecturer. Publication of the various sheets accompanied by memoirs, with full discussions of the stratigraphic and tectonic conditions and mineral resources is in preparation. In various parts of the area geophysical surveys have been undertaken, the results of which are interesting from many points of view. They disclose, e. g., the underground structure of the 'Arava, which seems to consist of a number of tectonic segments each inclined towards the north. This survey too permits to estimate the vertical displacement of strata beneath the 'Arava, as compared with the Negev highlands.

Mr. Z. L. SHIFTAN next read a paper on *Underground Water in the Negev.* The normal quantity of underground water is determined by the rainfall minus runoff and evaporation. In the Negev the total rainfall is scanty: it often comes in floods and the runoff is considerable. The quantity of underground water is consequently small. Another difficulty is the high salinity; Beduin are used to drinking water with 2000 mg. of chlorine per litre. This high salinity is the result of evaporation in closed valleys, which leaves the salt content of the evaporated water in the ground. Hydrologically the Negev is divided into four zones: the coast with a high water table, the Beersheba region with local water tables at greater depth, the Negev mountains with very deep underground waters and the 'Arava, where the water table is higher. The water in the coastal area is salty and irrigation has to be supplied from other districts. The Nir 'Am area from which water is supplied is fed by floods of the Shiqmah Valley. In the second area the ancient wells made use of local water tables based on impermeable rock. A major source for underground water are the areas with gravel beds (300 mg. chlorine only). Borings 500 m. deep in this area have occasionally succeeded in finding water with only 270 mg. of chlo-

rine. In the mountain area the only hope of finding underground water lies in the wadi gravels with their secondary water tables. The impermeable strata of the Upper Cretaceous give some hope in this direction near Kefar Yeruḥam, south of the Large Makhtesh, and in the 'Ovdat Plateau. The situation in the 'Arava is different again. Here there are three areas: in the north springs are plentiful but are contaminated with salt and the underground water horizon which feeds them should be exploited at the fault; in the Central 'Arava and the Zin Valley water may be found in the gravel beds. In the Elath area water is plentiful and not too salty, but care should be taken not to exhaust the accumulation of underground water by wasteful exploitation.

Dr. I. SCHATTNER gave a *Geomorphological Survey of the Sinai Peninsula.*

The geomorphological and geological data in the Sinai can explain some of the problems connected with Southern Israel, such as the straight coastline; the former view that this is caused by Nile sand carried northwards has now been abandoned but a new solution is still awaited. The transition area between the coast and the mountains in the Sinai presents a series of complicated anticlines of the same direction as those found in the Negev; occasionally these form mountains resembling the *makhteshim*. It has been found that the central part of the peninsula is built of 2-3 cuestas; their inclination is towards the Mediterranean and they have a decisive influence on the hydrographical pattern of the Central Sinai, including the Wadi el-'Arish. The Southern Sinai is a composite *horst*, the most characteristic aspect of which are the long faults accompanying the Gulfs of Elath and Suez. The faulting on the east is much more intensive. The depression of the Gulf of Elath is accompanied by parallel secondary ones in the eastern part of the Sinai. The hydrographical pattern of the Sinai depends on its tectonic configuration; the way in which the wadis break through almost normal to the anticlines is most revealing.

Dr. D. ASHBEL next lectured on *The Climate of the Negev.* The high mountains rising to over 1000 m. cause a greater quantity of rain to fall there than in the areas to the north and west, and this is the cause of the strong floods in winter. Most of these flow into Egypt; in 1947 the Egyptians were preparing to build a dam for a reservoir with a capacity of 300 million cubic metres, to be fed by Negev floods. The drainage area of the Dead Sea too carries occasionally heavy floods: on 2 April 1940 the Zin Valley near Ma'aleh 'Aqrabim had a flood of 450 cu. metres per second. The rainfall in the high mountain areas is now estimated at 200-250 mm. p.a. The exact measurements have not yet been obtained owing to damage to rainfall totalizers. In any case there are great quantities of rainwater to be stored and used for domestic purposes and irrigation. The dew should also be taken into account; the Negev is one of the areas richest in dew in Israel, there being 200 days with dew in the Rafiaḥ-Urim region, especially in summer. The total quantity of dew per year is not far below that of the annual rainfall, i. e. 150 mm. in the Gevuloth area.

The last paper of this session was read by Prof. M. ZOHARY and dealt with *The Vegetation of the Negev.*

The two problems of interest on this subject are the continued existence of vegetation in hilly areas with 75 or even 50 mm. of annual rainfall, and the possibility of enlarging the natural vegetation once perpetual grazing has ceased. As regards the first problem, it seems very doubtful whether cultivated plants can replace the wild flora under desert conditions; as regards the second, the five years during which grazing has practically ceased have not produced any appreciable increase in the vegetal cover. From the point of view of the flora the Negev can be divided into four areas:

1. The loess lands round Beersheba have been cultivated since antiquity and contain almost no traces of natural vegetation.

2. The sandy areas are divided into three groups: the coastal dunes, the area of Tureiba in the centre, and the 'Arava sands which are a product of granite and Nubian sandstone. The sand is the most hopeful soil for vegetation in the Negev, because it absorbs rain and prevents evaporation. Some Negev dunes have a dense plant cover, and south of Gevuloth a considerable part of these dunes do not move and can be cultivated. The same applies to the Tureiba sands in the centre.

3. The third area are the *hammadas*, which cover most of the Negev. These are desert pavements, from which the finer particles of fertile soil have been carried away by the winds, leaving only residual stones. The main plant of these areas is the *Zygophyllum dumosum*. 12 km. south of Sdom the desert is absolute, except in the wadi beds.

4. The fourth area is the salt-pans. If these are the result of salt water flowing, trees may grow in them, especially tamarisk species, which tolerate a high percentage of salts provided underground water is not deeper than twenty to thirty metres.

At the Seventh Session held on the same day Dr. Y. BEN-TOR lectured on the *Mineral Resources of the Negev*. The lecturer reviewed the results of the geological survey of the Negev, summing-up the ensuing division into geological regions. He then gave a general survey of the mineral resources found so far. In the Negev a number of minerals of commercial value have been found, some of them in considerable quantities. Their mineral content is of varying degree and they generally belong to the less valuable groups of mineral resources. They will, however, certainly be useful in the industrial development of the country, especially as these materials would have to be imported unless locally available. They include phosphate rocks, raw material for the prodution of fertilizers, quartz sand, the raw material of the glass industry, fire clay for porcelain manufacture. There are other materials such as copper, barytes etc., the extent and quality of which have not yet been sufficiently explored to allow reasoned judgment on the possibilities of their exploitation. Drilling for oil was scheduled to begin in the near future, but only the results of a considerable number of test wells will prove whether there are real chances of an oil industry in the Negev.

Brigadier Y. ALLON gave an account of *The Battles of the Negev*. After a period in which the Jewish settlements in the Negev were cut off by the Egyptian invaders from May 1948 onwards, they

were liberated in the operations of October of that year, which resulted in a break through the Egyptian line Migdal-Beth Guvrin. In the subsequent operations Beersheba was occupied, communications by land established with Sdom, and the Central Negev cleared (December 1948—January 1949). In March 1949 came the crowning achievement: detachments of the Israel Defence Army occupied the shores of Elath, allotted to the Jewish State by the United Nations.

September 28th was taken up by two excursions, one directed by Dr. D. H. K. Amiran to Eboda and the Makhtesh Ramon; explanations of the antiquities and natural features were given by Mrs. Ruth Amiran, Mr. Y. Aharoni and Mr. J. Braslawsky. The second party visited the Large and Small Makhtesh, the 'Aqrabim Pass, the Phosphate Works and Sdom (Sodom). The party was conducted by Mr. M. Harel, and explanations were given by Dr. Y. Ben-Tor and Dr. J. Vroman.

The last day of the Convention, September 29th, was devoted to a visit to the new settlements in the Negev, under the guidance of Mr. J. Weitz and at the invitation of the Jewish National Fund. Visits were paid to Ḥatserim, Gevuloth, Mivtaḥim and Magen.

The Eighth and concluding Session was held in the Tree Nursery of the Jewish National Fund at Gilath. Mr. J. WEITZ spoke on *The Settlement of the Northern Negev.*

He recapitulated briefly the recent history of settlement, beginning with the establishment of three experimental settlements in 1943. It was then found that settlement was possible and by a rational system of rotation and water conservation the crops could be increased fourfold. The pioneer stations were followed by the establishment of 11 new settlements in one day, in October 1946. Today the number of settlements is 93; they receive 60,000 cubic metres of water, 90% of it for irrigation. The area irrigated is 17,730 dunams. Winter crops can be grown if the rainwater is supplemented by irrigation. The crops grown include alfalfa; olives and vines are especially successful. The saline areas are being dealt with by washing the soil and spreading gypsum. Afforestation activities include road-side plantations, planting of trees along the contours of the hills, and wind screens around plots and forests to stop the spread of the dunes eastwards.

The Convention was closed on September 29th by Prof. M. Schwabe, Chairman of the Israel Exploration Society.

HEBREW BOOKS AND PAPERS

Books

Zemirin, S.: *Yoshiyahu u-Tekufato* (Josiah and his Times). Jerusalem: Bialik Institute, 1951. 120 pp., 3 maps and Figs., 7 Pls. (Preface by Prof. J. Klausner.)

Shalom Zemirin was one of the most promising students of Israelite history at the Hebrew University, and this book was his thesis for the M. A. degree; unfortunately it is his last work, for the author fell in defending Galilee against the Syrian invaders in 1948. The book is divided into five chapters, dealing successively with the general historical background of the period, the activities of King Josiah, the internal state of Judah, the growth of the kingdom in his days, and his final defeat at Megiddo; a summary concludes with an appreciation of the religious and political results of Josiah's reign. The author has utilized the latest cuneiform discoveries concerning the troubled period which ended with the fall of Nineveh and the rise of the Neo-Babylonian empire. Zemirin's original views on the sources find expression in his critical review of the opinions of various scholars who have recently dealt with this period, such as Gadd, Alt and Noth; his untimely death has cut short the career of one of the most promising younger scholars of Israel.

Em ha-Moshavot Petaḥ Tiqvah (The Mother of Settlements—Petaḥ Tiqvah). Diamond Jubilee Volume, Municipality of Petaḥ Tiqvah, 1953. xvii & 588 pp., 9 Figs., 32 Pls.

After a preface by Mr. David Ben-Gurion, the bulk of this volume deals with the history of Petaḥ Tiqvah, the first agricultural settlement of Israel, founded in 1878. Its annals are here recounted by G. Kressel who follows step by step the eventful years since the establishment of Petaḥ Tiqvah by a group of Jerusalem Jews fired by the desire to exchange their ghetto-like existence for life in the open. After many vicissitudes caused both by man and by nature, they and their successors won the hard fight and the present flourishing town is the result. The history is followed by a series of chapters, written by various authors and dealing with the geography of the region (A. J. Brawer), its earlier history (M. Avi-Yonah), its geology (M. Avnimelech) and its flora (M. Zohary).

Papers

PAPYROLOGY

J. J. Rabinowitz discusses a document found at Nitsanah and published originally by M. Schwabe; in the author's opinion this document registers the release of a boy who has been a pledge for a loan. The wording of the document presents parallels with Aramaic legal formulae found in Babylonia and in the Mishnah; parallels can also be found in Middle Assyrian laws, Aramaic papyri and the Greek documents establishing a release from *paranome*. The introductory formula 'In the name of God' represents old Jewish notarial practice, which was adopted in opposition to the Hellenistic practice of referring to the king at the beginning of documents. The signature by one witness is explained by a parallel Mishnah, where the scribe is counted as a witness. (*BIES*, 17, 1953, pp. 98-107).

NUMISMATICS

M. Narkiss discusses a coin struck by Sepphoris in the year 14 of Nero and 11 of the city, and honouring Vespasian the 'Peacemaker' on the reverse. He establishes the existence of an era of Sepphoris beginning with the transfer of the Roman administration there in 56/57. The honour paid to Vespasian is explained by the well-known pro-Roman attitude of the city during the First Roman War. (*Ibid.*, pp. 108-120).

CLIMATOLOGY

J. Neumann and N. Rosenan deal with *Evaporation in Israel and in the Surface Drainage Area of the River Jordan* (Israel Meteorol. Serv., Meteorol. Circular, 1953, 4 pp., 2 cartograms, 3 tables). In order to obtain reliable data on evaporation without taking recourse to figures on runoff and stream flow, the authors computed cartograms of rainfall and of actual evapotranspiration for squares of 20 × 20 km. They arrive at an estimated evaporation of about 1,100 million cu. m. per annum, with an estimated surplus of rainfall over evaporation between 100 and 200 million cu. m. per annum.

REVIEWS

Mayer, L. A.: *Mamluk Costume: a Survey.* Genève: Albert Kundig, 1952. 120 pp., XX Pls. Index. Bibliography, pp. 83-111. Sfrcs. 20.

A hundred years ago the famous orientalist R. Dozy published a 'Dictionnaire détaillé des noms des vêtements chez les Arabes', being a collection of notices found in literary works. Since then, little progress has been made in this branch of Moslem archaeology. That three generations of Orientalists abstained from continuing Dozy's researches can, however, easily be understood. Few specimens of Saracenic dress from those remote ages have been preserved, the illuminations to be found in MSS. are conventional in style and the chroniclers mention dresses without describing them. L. A. Mayer was the right man to undertake research in a field where so many difficulties have to be overcome. By his previous works, his *Saracenic Heraldry*, for example, he has become renowned as a scholar of painstaking accuracy, who adheres to the rule 'imprimatur nonum in annum'. As he says in his preface, he planned a comprehensive history of Saracenic costume, but later decided to publish this work, which deals with the Mamluk period only. As we are to have a work on one period, this was a good choice indeed. There is hardly a period in Moslem history which is so rich in historical works containing details of the life of different classes of society.

Furthermore, investigation of the various aspects of the Mamluk society is highly interesting. In the thirteenth and fourteenth centuries the Mamluk state, comprising Egypt, Palestine, Syria and parts of the adjacent countries, was the heart of the Moslem world. It was a state ruled by a military aristocracy of former slaves hailing from various countries and was continually reinforced by the acquisition

of new slave-recruits (Mamluks). The natives of Egypt and Syria being excluded from the foreign ruling caste, a class state was established in which every group of the population had a different profession and way of life, and was even distinguished by its dress. The Mamluks indulged in luxury, as is shown by many reports of Arab historians. They used to parade in the streets of Cairo in silk garments adorned with gilt embroidery and precious stones. The other classes of society did their best to imitate them. The sumptuary laws of Islam, which strictly forbid these costly dresses, were not kept either by the Mamluks or by the top-ranking theologians. A peculiar feature of Mamluk taste was the special liking they had for clothes trimmed with fur, such as sable, castor and grey squirrel. This predilection was due to the fact that most of the Mamluks came from countries with a climate colder than that of the Arab East and were accustomed to wear furs. To what degree fashion in Mamluk kingdom was influenced by the origin of the ruling military caste may be seen from reports of Arab historians, saying that in the second half of the thirteenth and at the beginning of the fourteenth century the Mamluks wore their hair long, exactly as the Mongols did.

Mayer deals in special chapters of his book with the attire of various ranks of Mamluk society. The caliph wore black, the colour of his Abbasid ancestors. The sultans dressed according to circumstances, but fond of luxury as they were, became the true leaders of this fashionable world. Any change made by them in their dress was immediately followed by the officers of the army. The caste of the emirs was distinguished by tight coats, the qabâ, which are called in Arabic chronicles, characteristically enough, 'Tartar coats'. The judges and theologians walked about in loose cloaks with wide sleeves, and also wore turbans. The religious minorities had to distinguish themselves by the colour of their headgear, the Christians wearing blue turbans and the Jews yellow. Women caused the authorities many headaches, as they had a weakness—common to all times and lands—for ever-increasing luxury. Sometimes they wore chemises with sleeves of an amazing size and sometimes theologians complained of their tight clothes, which showed their figures too clearly. Other chapters of Mayer's book deal with 'robes d'honneur', so lavishly distributed by the Mamluk kings and governors, and with their arms and armour.

The author analyses the changes in fashion which occurred from time to time, according to the reports in printed chronicles and MSS. Generally speaking, he has spared no effort to obtain all the information available. With his cautious manner of thinking he is not inclined to conjectures, and when unable to solve a problem, he frankly admits it. For a second edition the reviewer would like to suggest that a chapter should be devoted to the dress of the middle classes, merchants and artisans. It is true that Mayer here and there touches upon the attire of these classes, but as officers and ecclesiastics, religious minorities and women got special chapters, why should the dress of the main classes of the Egyptian society not be dealt with too? We say 'Egyptian society', because this is the real subject of Mayer's work, even if it is not

stated explicitly. Not very many passages are quoted from Syrian chronicles. An investigation into the differences between the local fashions of Egypt, Syria and Palestine would be most interesting, but alas, our sources are unhelpful on this point. Ibn Khallikân in his biography of an Aleppine poet who died in 1237 says that he dressed as the people of his town did in old times, and wore a slit turban (ed. Cairo 1310 II, p. 411). As Mayer confines himself strictly to the Mamluk period this notice cannot be taken into consideration. But we may assume that dresses worn a short time before the beginning of the Mamluk period remained in vogue even later. From a passage in Ibn Abî Uṣaibî'a's biography of the Christian Ibn al-Miṭrân, one of the physicians of Saladin, and from another which is to be found in his biography of the Samaritan physician Amîn ad-daula Abu 'l-Ḥasan b. Ghazzâl, who was executed in Cairo in 1251, we learn that physicians wore robes of watered silk, s. *'Uyûn al-aṭibbâ* II, pp.177,236. So we may add to the dresses peculiar to various classes as listed by Mayer that of the medical profession. It may be taken for granted that even the students of the madrasas had a dress of their own everywhere, see *Mir'ât az-zamân* of Sibṭ b. al-Jauzî (ed. Jewett, p. 327). A crucial point is the question if and when trousers were worn by males and females. The chroniclers report that in the beginning and immediately after the end of the Mamluk rule the authorities issued edicts forbidding men to go out without trousers. These notices clearly prove that people were unwilling to wear trousers and did not do so. As to the wearing of trousers by women, Mayer is not sure if it was a general habit, because they are missing in the lists of trousseaux from that period. In this connection, attention should be drawn to the statements of two Italian pilgrims of the late fifteenth century who described in their travel-books the fashions of the Arab East. Both the Christian Santo Brasca and the Jew Meshullam of Volterra say that in these lands men do not wear trousers but women do (Santo B.: *Descrizione o sia relazione del suo viaggio a Gerusalemme.* Milano, 1481, f. 15a; Mikhtav Massa' l'R. Meshullam, *Jerusalem* [ed. Luncz], 1, 1882, p. 173).

Further material which may be found in hitherto unknown sources will possibly elucidate some questions dealt with by Mayer which still remain obscure; but this will not diminish the lasting value of his work.

E. ASHTOR

Moldenke, H. N. & A. L.: *Plants of the Bible.* New Series of Plant Science Books, 28. Waltham, Mass.: Chronica Botanica Co.; London: Wm. Dawson & Sons, Ltd., 1952. xx & 364 pp. 95 ill. $7.50.

Dr. and Mrs. Moldenke published a book on an old and controversial topic, the plants of the Bible. The authors studied over 600 publications on the subject, beginning with the various translations of the Bible and the works of such ancient writers as Pliny, and ending with the most recent ones. The current work of Israel scientists such as Zohary and Evenari has been taken into account, and their opinions decide many a difficult issue.

One of the main achievements of the authors is the identification of all the plants mentioned in the Bible according to modern botanical nomenclature. In this connection many varying opinions are quoted, often as many as there are writers dealing with the subject. The ancient and modern descriptions of each plant are given, together with its habitat and conditions of growth, and its occurrence in the Holy Land and throughout the world. There is much general information about each plant, apart from its day-to-day and ritual use. In connection with agricultural and pharmaceutical plant products, we get an excellent view of farming practices in Biblical times. We become acquainted with the crop plants: wheat and barley, grapes, figs and pomegranates, olives, etc., as well as with many honey-producing flowers. Ancient methods of cultivation are compared with those of today. The whole story is told in simple language and enlivened by numerous folk tales.

Plants of the Bible makes most interesting and enjoyable reading. The combination of story-telling with scientific interpretation gives an excellent picture of Biblical times. We see before us the daily lives of our forefathers and the way they gained their livelihood. We take part in their festivals and rituals and become acquainted with their beliefs in the curative and magical powers of herbs, which influenced both the human soul and the spirits which populated their universe. As the account includes fungi and bacteria, we are able to form an idea of the diseases and plagues of those times, and we see the life of the period in a new light.

The listing of all the pertinent material concerning every botanical term which appears in the Bible, including verse quotations, makes the work an invaluable index. There is in addition much philological material—comparison of translations into various languages—which gives an approach to the subject from different points of view.

Although this reviewer greatly enjoyed reading the book, he feels that there is room for some critical remarks. Some of the most interesting questions raised in *Plants of the Bible* do not receive clear-cut answers. The authors often make numerous remarks on a given subject, but do not come to a definite conclusion. This may be advantageous for the scientist, who is able to form his own opinions, but the unprofessional reader may find that, having looked up a particular topic, he is still left wondering. A conclusive statement and a summary by such an authority as Dr. Moldenke would have been welcome. It would also have been helpful to add an index of plant names in Hebrew so that the reader of the Bible in the original could find direct references.

Special mention should be made of the good taste with which *Plants of the Bible* is edited. The two authors present many photographs and drawings showing the Biblical landscape, the plants and the people who grew them. The book is beautifully and elegantly produced.

N. TADMOR

Air-photograph of the surroundings of Jotbathah. The arrow points to the Roman fortress.

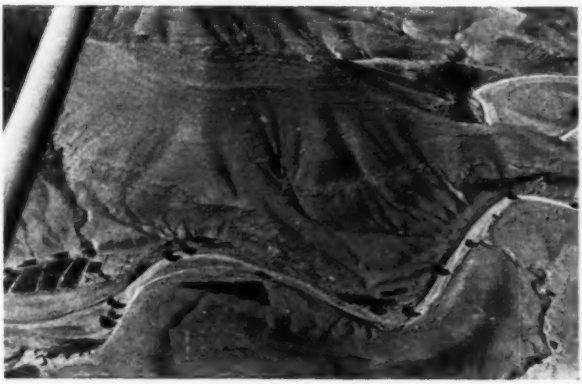
A: Jotbathah. In the centre the quadrangular Roman fortress with remains of a tower.

B: Jotbathah. Remains of wall of the Roman fortress.

A: Terrace cultivation in a tributary of the Zin Valley. *Thymeloea hirsuta* bushes reinforce the terrace walls.

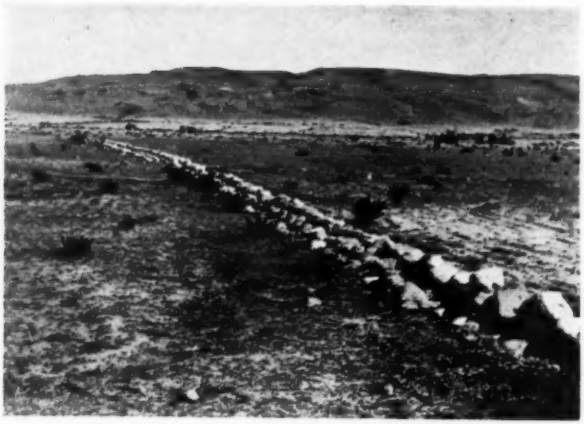
B: Air view of typical cultivated area in tributary valleys near the Elah Valley. Dark ground is ploughed, lighter ground fallow.

C: Air view of part of the Elah Valley. In lower left-hand corner cultivated plots on both sides of the valley. Trees of *Pistacia atlantica* grow along the valley bottom.



(D. Zohary phot.)

PLATE 4



A: Zin Valley near 'Ovdat. Cultivation in the main valley. The wadi bed can be seen beyond the cultivated field.

B: Terrace wall in the Zin Valley.

C: Barley crop on field in Zin Valley, Spring 1945.

(J. Wahrman phot.)

ABBREVIATIONS

AAA	Annals of Archaeology and Anthropology
AASOR	The Annual of the American Schools of Oriental Research
'Alon	Bulletin of the Department of Antiquities of the State of Israel
BA	The Biblical Archaeologist
BASOR	Bulletin of the American Schools of Oriental Research
BIES	Bulletin of the Israel Exploration Society, continuing:
BJPES	Bulletin of the Jewish Palestine Exploration Society
BRCI	Bulletin of the Research Council of Israel
CRAI	Comptes-rendus de l'Académie des Inscriptions et Belles-Lettres
EI	Eretz-Israel: Archaeological, Historical and Geographical Studies, published by the Israel Exploration Society
IEJ	Israel Exploration Journal
JNES	Journal of Near Eastern Studies
JPOS	The Journal of the Palestine Oriental Society
PEQ	Palestine Exploration Quarterly, continuing:
PEFQSt	Quarterly Statement of the Palestine Exploration Fund
PJb	Palästinajahrbuch des Deutschen evangelischen Instituts für Altertumswissenschaft des Heiligen Landes zu Jerusalem
QDAP	The Quarterly of the Department of Antiquities in Palestine
RB	Revue biblique
ZDPV	Zeitschrift des Deutschen Palästina-Vereins

MT	Massoretic Text of the Old Testament

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*VOLUME 4 * NUMBER 1*

1954

PRINTED IN ISRAEL

HADASSAH APPRENTICE SCHOOL OF PRINTING, JERUSALEM